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ABSTRACT

This nationwide study was concerned with the relation of personality traits, classroom behavior, and student-teacher relationships to creativity in college teaching. Creative teachers were identified by Ph.D. students who had studied under the teachers and who nominated them as having had the most facilitating effect on their creative development, or as having had a significant inhibiting effect. The classroom behavior and student-teacher relations for a total of 671 teachers were described by nominating students, and 492 of these completed the 16 Personality Factor Questionnaire, the Ghiselli Self-Description Inventory, the Barron-Welsh Art Scale, and several biographical items. Results indicate introversion, dominance, and self-sufficiency to be associated with creativity. Support was also provided for association of greater esthetic sensitivity and less adherence to social mores with creative teaching in psychology. Clear-cut behavioral patterns differentiate teachers who facilitate creative development from those who hinder it. Encouragement through individual contact is found to be the most important aspect of student-teacher relationships affecting creativity. The classroom was found to be of lesser importance. (Author/HS)

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COLLEGE TEACHERS: THEIR EFFECT ON CREATIVITY OF STUDENTS

March 1972

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Office of Education

National Center for Educational Research and Development
(Regional Research Program)

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Jack A. Chambers

University of South Florida

Tampa, Florida

March 1972

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ABSTRACT

This nationwide study concerned the relation of personality traits, classroom behavior, and student/teacher relationships to creativity in teaching at the college level. Creative teachers were identified through an evaluation of the research of those Ph.D. students who had studied under the teachers, and who nominated them as having had the most facilitating effect on their creative development, or as having had a significant inhibiting effect. Normative groups matched on relevant variables also nominated teachers. The classroom behavior and student/teacher relations for a total of 671 teachers were described by nominating students. Four hundred ninety-two of these teachers completed Factors A, C, E, G, and Q_2 of the 16 Personality Factor Questionnaire, the Ghiselli Self-Description Inventory, the Barron-Welsh Art Scale, and several biographical items.

Results indicated introversion, dominance, and self-sufficiency to be associated with creativity. Support was also provided for association of greater esthetic sensitivity and less adherance to social mores with creative teaching in psychology.

Clear-cut behavioral patterns differentiated teachers who facilitated creative development from those who hindered it. Encouragement through individual contact was found to be the most important aspect of student/teacher relationships affecting creativity. The classroom was found to be of lesser importance.

PREFACE

For about the first sixty years of its existence as a science, psychology concerned itself primarily with the problems of abnormal behavior. About twenty years ago the field suddenly began to be concerned about the understanding of normal behavior; it then only took ten more years for an interest to be generated in the highest levels of behavior which, if understood and facilitated, could result in many significant advancements within the entire culture.

This research study represents a continuing attempt by the investigator to understand creativity, and to aid its facilitation. The project required almost three years for completion, and necessitated large amounts of help from professional persons all over the United States. Specifically, thanks are due to those members of the National Academy of Sciences and other distinguished research psychologists and chemists who read and evaluated the research papers of the subjects in the study. The four consultants to the study--Drs. Theodore Ashford and Sidney J. French of the University of South Florida, Dr. Frank Barron of the University of California at Santa Cruz, and Dr. Raymond B. Cattell of the University of Illinois, plus Dr. Herbert Kimmel and Dr. Joe Sidowski of USF's Department of Psychology, and Dr. Cal Maybury of USF's Chemistry Department, all gave generously of their time. Research assistants on the project, Mrs. Cecile Pulin, Mrs. Marcy Fox, Mrs. Ruth Turner, Miss Dorothy Dootson, Mr. Ernest Cowles, and Miss Juanita Wharton, worked far beyond the call of duty, as did the programmer assigned to the project, Mr. Ed Nestor. Similarly, the project would have been at least another year in completion had it not been for the professional assistance provided by the investigator's wife, Ruth.

Finally, a word of appreciation is extended here to Dr. Charles Wrigley of Michigan State University--the person who gave the needed encouragement to a graduate student which helped him to complete and publish his first study of creativity.

Jack A Chambers

Jack A. Chambers

Tampa, Florida
March 1972

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COLLEGE TEACHERS: THEIR EFFECT ON CREATIVITY OF STUDENTS

INTRODUCTION

Are the traits that are necessary for creativity in teaching the same as those traits that are necessary for creativity in research? What kinds of teachers facilitate the development of creative abilities in students? What kinds of teachers hinder the development of creativity in students? What do these teachers do in the classroom? How do they treat students outside of class? Are the teachers who facilitate the development of students who have a high potential for creative research different from those teachers who facilitate the development of other students?

Studies of highly creative scientists and artists (Roe, 1946, 1953a, 1953b; Clifford, 1958; MacKinnon, 1961a; Barron, 1961; Cattell, 1959; Cattell & Drevdahl, 1955; Drevdahl & Cattell, 1958; Chambers, 1964), studies of research scientists in laboratories around the country (Van Zelst & Kerr, 1951; Buel & Bachner, 1961; Morrison, 1962; Taylor & Ellison, 1967), as well as studies of creative students (Parloff & Datta, 1965) have in general produced similar findings. The more creative persons, when compared with their less creative peers, usually turn out to be more self-confident, dominant, strong-willed, and introspective. They are "self-starters." They are independent non-conformists, relatively unconcerned with group approval of their actions, and relatively uninterested in socialization. On the whole they are highly sensitive, which apparently relates to a lack of strong identification with either parent. This has not been interpreted as indicating homosexual tendencies or behavior in these creative men and women. Rather, it appears that the creative persons have chosen not to conform to a given mold but rather to express their sensitivities and other characteristics through their creative abilities. In addition to the above, highly creative persons seem to be more flexible than their less creative peers. They also appear to prefer complexity, i.e., to have an apparent appetite for disorder due to obtaining pleasure from bringing order to a given situation. Finally, as Maddi (1965) has pointed out, the need for quality, or excellence is a vital ingredient in high-level creativity. Thus the creative person seeks to do things in certain ways, and with certain end results, that he himself considers to be excellent. Maddi (1965) pointed out that D. H. Lawrence rewrote "The Rainbow" eight times, and Clifford (1958) in his study of creative chemists and mathematicians spoke of his subjects striving not just for answers to problems but for elegance in their work.

Are the above personality traits an essential part of all creativity, including creative teaching? This study attempts to provide evidence in this regard.

The theoretical orientation for this study, as well as a review of the literature on creativity, has been published recently by this investigator (Chambers, 1969). The overall dimensions and hypotheses advanced in the theory are given in the following pages.

What is Creativity?

Definition:--Creativity is a multidimensional process of interaction between the organism and its environment which results in the emergence of new and unique products. The three main dimensions of creativity are level, field, and type.

In regard to level, the extent to which the creative product restructures our universe of understanding, would serve as a basic guideline for determining the level of the creative product. An example of low level would thus be the discovery of a new filing method by a secretary. The method was probably known to others, but unknown to the secretary, who arrived at it in an attempt to evolve a new solution to a given problem. An example of high-level creativity would be a vaccine to prevent cancer from developing in humans.

Field refers to the medium in which the creative process occurs and is given form. Thus, creativity may occur in the arts, the sciences, in business, in interpersonal relationships, ad infinitum. At the lower levels, the list would be endless; at the upper levels we normally think of creativity in terms of the arts, the sciences, and in high-level social endeavors.

Types of creativity refer to the three main ways in which creativity occurs, and the types simply represent heavier emphases on one of more components of the process. The three main types are: (a) theoretical creativity; (b) developmental creativity; and (c) scholarly creativity. Theoretical creativity is most heavily dependent on intellectualization--on the emergence of new and fresh ideas and their ramifications--rather than on the carrying through of these hypotheses and ideas to their utmost fruition. The products here are the ideas and the hypotheses. In psychology, Eric Fromm offers a good example of such creative work. In developmental creativity there is a dearth of new ideas, but greater dependence on the identification of novel ideas in others, and the developing and/or testing of such ideas. Thus work is brought to fruition which quite often had its origin in others. In art, many of the current abstractionists would fall into this category. Finally, scholarly creativity involves both generation of new ideas and the carrying through of the necessary work to develop these ideas to their highest levels. The best example that comes to mind of this type of creativity is the work of Thomas Edison.

Creativity is thus seen as a multidimensional process which expresses itself in the behavior of all organisms, from lowest to highest. The remainder of this summary will list the basic hypotheses comprising the theory.

Why Does Creative Behavior Occur?

Motivation

Hypothesis #1.--The basic motivation for creative behavior resides in neural and muscular tissue and is originally elicited by novelty in the environment.

Hypothesis #2.--There are multiple bases for the development of strong motivation for high-level creativity in adults, arising from factors such as the drive for mastery, basic insecurities, curiosity, rivalry, etc.

Hypothesis #3.--Mental health has little effect on creativity--provided ego control is maintained--although it may serve as one of the bases for motivation.

Intellectual and Special Abilities

Hypothesis #4.--A minimal level of divergent thinking abilities is essential for creative productivity. Beyond this "floor" there is no relationship between level of divergent thinking abilities and level of creativity. The "floor" level varies according to the specific dimensions of creativity involved.

Hypothesis #5.--A minimal level of convergent thinking abilities is essential for creative productivity. Beyond this "floor" there is no relationship between level of convergent thinking abilities and level of creativity. The "floor" level varies according to the specific dimensions of creativity involved.

Hypothesis #6.--A minimum level of special abilities is essential for creative productivity in certain fields.

Personality Traits

Hypothesis #7.--A strong ego, a preference for complexity, esthetic sensitivity and flexibility in thinking are all essential personality traits for creative work regardless of level, field, or type.

These personality traits are needed at a higher level than the general population in order to produce creative work.

Level and Field. Obviously, much higher levels of each personality trait would be needed for high-level creativity than for low level. Additionally, greater esthetic sensitivity would be needed in the art fields and in interpersonal creativity (sensitivity nuances of human behavior), than would be necessary in most scientific fields.

Type. Flexibility in thinking appears to be most important for creativity of the theoretical type, and secondly for the scholarly type. Developmental creativity would seem to depend less on this personality trait than any of the other types, and in fact, this trait would fall at the bottom of the list of necessary factors causing developmental creativity to occur, while motivation would head the list.

Hypothesis #8.--Six other personality traits are essential for high-level creative productivity: initiative, dominance, introversion, independence, perseverance, and a striving for excellence.

Level and Field. The higher the level, the greater the degree of the traits needed regardless of field.

Type. Theoretical creativity depends more on initiative and independence, developmental on dominance, perseverance and striving for excellence, and scholarly on all five traits.

Hypothesis #9.--Flexibility in thinking is the main factor differentiating high creative from low creative work of equally productive persons.

How Does Creative Behavior Occur?

Hypothesis #10.--The creative process consists of: (1) an exploration of the environment; (2) an "inward turning" and concentration on association of previously internalized stimuli; (3) a manipulation of the environment (to produce the product) with frequent comparisons of the product against both internal and external criteria.

Hypothesis #11.--Too little stimulation or a lack of stimulation in breadth in early lives or a lack of stimulation in depth in the later lives of persons will significantly affect the creative process in their adult lives in a negative manner.

Hypothesis #12.--A continuation of stimulation of a breadth nature from late adolescence on will result in competing or distracting stimuli being introduced into the creative process in the adult lives of persons and will significantly affect the process in a negative manner.

Two hypotheses from the theory will be tested in this study. These hypotheses are:

Hypothesis A (hypothesis #7 from the theory)--A strong ego, a preference for complexity, esthetic sensitivity, and flexibility in thinking, are all essential personality traits for creative work regardless of level, field, or type.

Hypothesis B (hypothesis #8 from the theory)--Six other personality traits are essential for high-level creative productivity: initiative, dominance, introversion, independence, perseverance, and a striving for excellence.

The second aspect of this study relates to the actual behavior of those teachers who facilitate and of those who stifle creativity in students. How do these teachers act in the classroom, and what are their relationships to students outside of the classroom? A rather staggering amount of research has been carried on over the years in regard to teachers in the classroom. Extensive bibliographies have been prepared (Barr & Jones, 1958; Eels, 1967), research has been reviewed (Morsh and Wilder, 1954; Ronan, 1971), and hefty reference volumes have gained popularity (Gage, 1963). In addition, with the recent public concern over teaching accountability much in evidence, individual faculty members, academic administrators, and professional organizations have become more openly concerned with teaching excellence and have sponsored extensive studies (Eble, 1972; Flournoy, 1972). Still, as most will admit, little is known about teaching or teachers. Or to put it another way, no one seems to know how to reliably differentiate good teaching and good teachers from that which is not so good, or even bad. A significant part of the problem seems to be the reliance in most studies on the rating of teachers by students as the main criterion. Thus studies reporting characteristics of "good" and "bad" teachers in most cases are portraying pictures of popular and unpopular teachers. Such teachers may or may not be "good" or "bad." It therefore appeared to this investigator that a much needed step in this research area was to identify those teachers who had been helpful in stimulating students to succeed in their chosen fields, and to identify those who had hindered success.

Probably the second biggest problem with studies of teaching is their overall lack of adherance to good research methodology, especially in regard to sampling techniques. Thus, studies have been largely concentrated at the high school and undergraduate level, have far too often represented a study of a small number of subjects in one or two colleges, or have relied heavily on the personal observations of one or more "experts" in the field. Generalizations from such data have yielded conflicting results at best.

The present study attempts to improve on previous studies of teachers by identifying successful and unsuccessful teachers through an evaluation of the successes in later life achieved by the students they taught (only successes attributable at least in part, to the role played by the college teacher are considered). In addition, the study, while restricted to two fields to permit comparisons between areas, includes a nationwide sampling of these fields.

The main objective of this portion of the study is to help determine if there are certain constants, both within the teacher and within the learning situation, which, if found, could be used as standards to assist in the early identification of creative teachers and in the types of training which could be provided for future teachers.

METHOD

Population and Samples

Since the study of teaching and its effect involves both the teacher and the student, both groups had to be identified. The research strategy first called for the identification of samples of those scientists who had produced creative research products. Samples from the general scientific population were then selected so as to match the original samples on relevant variables. These latter groups, however, had not produced creative research. These scientists were then asked to identify by name, the teachers who most stimulated them and facilitated their development as creative scholars, as well as those teachers who contributed most to the suppression of their creative impulses and most heavily damaged their growth as creative scholars. To insure that the teachers were still living and relatively able to participate in the study, only scientists who had received their doctorate since 1955 were selected.

The first sample consisted of creative male scientists who had received the Ph.D. since 1955 in psychology or chemistry from a U.S. university. The selection procedures are given below.

First, department heads in psychology and chemistry were contacted at each university offering the Ph.D. in the field concerned, as listed in "A Guide to Graduate Study" (Graham, 1965). The department heads were asked to confer with their faculties, and all were asked to participate in an investigation of creativity in the sciences. As part of this investigation they were told there was a need to identify men who had received their Ph.D. from their department since 1955, who had already given evidence (through publications or unpublished papers) that they had contributed to their profession through highly creative research. Creativity was defined according to the definition given earlier in this paper, and department heads and faculty were asked to evaluate research on the basis of the extent to which it restructured the universe of understanding in the given area. The more it restructured the universe of understanding, the higher the rating of the research (on a creativity scale) was to be. A rating of one was to be given to those students whose work was considered highly creative and top quality and a rating of two to those men whose work was considered highly creative but not of top quality. The department heads were then asked to forward the resulting lists to the Principal Investigator.

In addition to the above, all of the members of the National Academy of Sciences in psychology were contacted, as was a list of distinguished research chemists employed in education, industry and government (provided by the chemistry consultant to the study). These men were asked to nominate and rate young creative scientists for inclusion in the study no matter where they took their doctorate, so long as it had been awarded after 1955, and so long as the individual had produced at least one piece of highly creative research. This rounded out the initial effort to obtain a truly representative sample of young, creative American psychologists and chemists. Once nominations were received, addresses were obtained wherever possible for the nominees. The nominated scientists were then contacted, the study explained to them, and their participation requested. They were asked to submit a reprint or unpublished paper which they had authored which represented their most creative research effort to date. In addition, they were asked to nominate those college teachers who, in their opinion, had significantly facilitated or inhibited their creative development.

The reprints and papers obtained in this manner were then submitted for review to distinguished research scientists in the appropriate areas. The research scientists who evaluated the manuscripts were selected in the following manner: (a) members of the National Academy of Sciences in chemistry and psychology were contacted and asked to serve as unpaid evaluators of manuscripts in their particular research area; (b) in addition, they were asked to nominate other scientists of strong research capabilities who they thought would be willing to also serve as evaluators; (c) eminent research psychologists and chemists identified in an earlier creativity study (Chambers, 1964) were contacted and asked to participate in the same ways as the National Academy of Sciences members; (d) this process was repeated until a sufficient number of evaluators had agreed to participate.

Each evaluator was sent a list of the titles of the manuscripts submitted by the scientists in the appropriate field, categorized by subfield (clinical psychology, organic chemistry, etc.). The evaluator then chose manuscripts he felt capable of evaluating, and these were forwarded to him, along with a form on which he was to record his evaluations. The form contained the definition of creativity and levels of creativity as defined earlier in this paper. Ratings were to be either 1, 2, or 3, with one and two defined the same as they were for the department chairmen and faculty (1=highly creative work of top quality; 2=creative work but falls slightly below top quality). Three was defined as "below minimum level for inclusion in grouping of highly creative research." The reviewers were then asked to return both the manuscripts and the rating sheets when completed. They were free to decline to rate any papers which proved to be outside their sphere of competency despite the title, and many reviewers did reject manuscripts at that stage.

The reviewing process continued until each manuscript had been read and rated by at least one person. Every effort was made to secure two ratings of each manuscript, but in many cases this was not possible.

The ratings assigned by the nominating department chairmen, faculty, and distinguished researchers were then combined arithmetically with the manuscript ratings and each young scientist was assigned to one of three groups based on the unweighted average of the ratings he and his manuscript had received. Average ratings and their group assignments were as follows:

1.0 to 1.5 - Group I
1.6 to 2.4 - Group II
2.5 to 3.0 - Group III

The second sample, to be known as Group IV, was chosen from the membership lists of the disciplines concerned, and were chosen so that, as closely as possible, Group IV would match Scientists I and II and III on the bases of discipline, sex, age, education, total number, and university in which the Ph.D. degree was taken.

The resulting Group IV lists were then purged of any names of persons who had been nominated by their departments or by distinguished researchers in the earlier part of the study. The lists were then sent to selected, distinguished research scientists in the field concerned. They were asked to delete from consideration any persons who, to their knowledge, had ever produced any creative research. Persons deleted in this way were replaced in the study through the above procedures.

The scientists comprising Group IV were then contacted. Like those in Groups I, II, and III they were asked to nominate those teachers in their undergraduate and graduate programs who had significantly affected their development as creative research scholars, either in a positive or a negative way.

Following the receipt of all nominations, each scientist in the study was again contacted, and asked to identify from among his previous nominees, that single teacher who had had the most significant facilitating effect on his creative development. Each man was further asked to complete a questionnaire (Inventory of Teaching Factors--see Appendix A) describing the in and out of classroom behaviors of the nominated teacher. Finally, since few negative nominations were received, each scientist was asked to complete an Inventory of Teaching Factors form for each of the teachers he had nominated as having had a significant inhibiting effect on his creative development.

The teachers, nominated through the above procedures, represent the real subjects of investigation in this study. They are identified throughout the remainder of the study as Groups I, II, III, and IV--the group designation having come directly from the average rating assigned to the scientist (and former student) who nominated the teacher. Since both positive and negative nominations occurred, Groups I, II, III, and IV positive are referred to as facilitating teachers, and all negative nominations are referred to as inhibiting teachers. Those facilitating teachers comprising Groups I, II, and III are identified as creative teachers, while those facilitating teachers in Group IV are identified as members of normative groups.

Measuring Instruments

Data gathering was accomplished through the use of the following instruments:

(a) Inventory of Teaching Practices (see Appendix A). This inventory was prepared by the Principal Investigator, based on the work of Ronan (1971) and others. It contains items pertaining to the behaviors of teachers in and out of the classroom, methods of teaching employed, classroom "atmosphere," and general relationships between students and teachers. In addition, write-in items pertain to the identification of significant events or factors in student/teacher relationships which lead to crucial effects on students' creative development.

(b) The 16 Personality-Factor Questionnaire (Cattell & Stice, 1957). The items contained in Forms A and B of the following factors were used: Factors A (Introversion), C (Ego-strength), E (Dominance), G (Perseverance), and Q_2 (Independence/Self-sufficiency). Developed and studied extensively in recent years through factor-analytic techniques, this test consists of items measuring a total of 16 factors, of which 15 are personality-type dimensions and one represents a measure of general intelligence.

(c) Self-Description Inventory (Ghiselli, 1954). This is an unpublished instrument consisting of 64 pairs of descriptive adjectives (32 positive and 32 negative) paired on the basis of social acceptability. The respondent is forced to choose one from each pair in the first 32 as the more descriptive of himself, and one from each pair in the latter 32 that is less descriptive of himself (Ghiselli, 1954).

An initiative key was developed for this instrument by having several hundred students evaluate their motives with respect to jobs (whether they preferred steady employment, a chance to show initiative, fair supervision, etc.), selecting extreme groups on the basis of preference for initiative or lack of it, and then determining differences on the items between the groups.

Validation was sought by examining scores of men who were candidates for management positions rated on initiative as recorded in work history, scores of foremen rated for job success, of managers rated for job success, and for line workers rated for success in an occupation in which initiative should have been associated with failure. Correlations were in the predicted direction, being .57, .24, .35, and -.29, respectively (Ghiselli, 1955).

What is initiative in the above sense? Ghiselli (1956) says a person high in this trait "is thought of as an inaugurator or originator who opens new fields, or conceives of new ways of doing things" (p. 312).

(d) The Barron-Welsh Art Scale (1963). This is a published instrument containing 89 black and white line drawings designed to measure esthetic sensitivity. Original item weights were derived by comparing frequencies of responses of 37 artists and art students with those of 150 people in general. Later studies have added norms for creative writers and architects. (MacKinnon, 1961b).

Procedure

Data from the Inventory of Teaching Factors were gathered in the manner described in the previous section. Two follow-ups to the original request were used.

The items from the 16 Personality-Factor Questionnaire, the Self-Description Inventory, and eleven items of a biographical and descriptive nature were combined into one questionnaire and printed (see Appendix B). These questionnaires were sent to the nominated teachers, along with a copy of the Barron-Welsh Art Scale (see Appendix C) and a personal letter explaining the study and requesting cooperation. Anonymity of response was assured. Self-addressed, stamped envelopes were enclosed, as were post cards which could be mailed separately in order to assure that a copy of the results would be sent to participants. Two follow-ups were used, spaced several weeks apart.

RESULTS

Characteristics of Responding Sample

The initial request for nominations of creative scientists sent to the psychology chairmen (N=120) and to the chemistry chairmen (N=232), elicited a usable response of 89% and 85% respectively. On the whole, most departments were extremely cooperative, and only a very few major departments declined to make nominations. The request for nominations sent to the psychology members of the National Academy of Sciences (N=28) and to the distinguished chemists (N=43) elicited responses of 61% and 77% respectively. Overall, a total of 423 requests for nominations were sent out, with an overall response rate of 84%.

The above groups nominated a total of 1,024 young scientists who had received the Ph.D. since 1955 and who had, in their opinion, produced at least one highly creative research paper. These nominations represented about 2% of the total doctorates awarded in psychology for the period concerned, and 3% of the total chemistry doctorates awarded. Table 1 provides a breakdown of the nominations by group.

The 1,024 nominated scientists shrunk to a total of 475 persons due to the unavailability of addresses for the other 549 men. The greatest loss was in the chemistry area, since the American Chemical Society only infrequently publishes a directory, and other relevant sources such as American Men of Science, etc. proved singularly unhelpful. The 475 men for whom addresses were available, were asked to participate through submission of their most creative research paper, and they responded favorably. A total of 410 persons submitted papers (201 psychologists and 219 chemists), giving an overall response rate of 86% (84% of psychologists; 93% of chemists).

A total of 227 persons then agreed to serve as evaluators and raters of the research. The number of National Academy of Sciences members and others serving in this capacity are given in Table 2. The total number of independent ratings obtained for research papers submitted by the scientists is given in Table 3. It may be noted that the total group was reduced at this point from 410 to 397, since it was not possible to obtain evaluations for 13 papers.

Creative subjects were then assigned to groups and normative group subjects selected. The total N and average ages of these scientists are given in Tables 4 and 5.

All subjects were then asked to nominate those teachers who had significantly affected their creative development. This resulted in a total of 2,696 nominations, with details as to number of graduate vs. undergraduate nominations and the like, given in Table 6. Descriptive material (completion of the Inventory of Teaching Factors) was then sought for that single teacher who had been most influential in facilitating the creative development of the scientists. Since there were relatively few recommendations of teachers who had inhibited creative

Table 1. Scientists Nominated as Having Produced Highly Creative Research

	Psychologists			Chemists			
Nominator	Rating "1"	Rating "2"	Totals	Rating "1"	Rating "2"	Totals	Grand Totals
Department Chairmen and Faculty	171	126	297	316	264	580	877
NAS* Members	18	7	25				25
Distinguished Research Chemists				90	32	122	122
Totals	189	133	322	406	296	702	1024

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*National Academy of Sciences

Table 2. Distinguished Research Scientists Serving as Evaluators of Research Papers

	Psychologists	Chemists	Totals
NAS Members	3	18	21
Recommended by NAS Member	6	16	22
Eminent Researsh Scientists*	25	24	49
Recommended by Eminent Research Scientists	3	3	6
Others	54	75	129
Totals	91	136	227

*Identified in previous creativity study (Chambers, 1964)

Table 3. Number of Independent Ratings Obtained for Research Papers Submitted by Scientists

Number of Ratings	Psychology	Chemistry	Totals
One Rating	147	47	194
Two Ratings	41	142	183
Three Ratings	3	14	17
More Than Three Ratings	0	3	3
Totals	191	206	397

Table 4. Number of Scientists

Group	Psychologists	Chemists	Totals
I	73	54	127
II	82	121	203
III	36	31	67
Subtotals, Creatives	191	206	397
IV	162	154	316
Totals	353	360	713

Note--These are the samples of creative and normative group subjects that made the original teacher nominations. The Inventory of Teaching Factors was sent for completion to this group.

Table 5. Median Ages of Scientists

Group	Psychologists	Chemists
I	36	38
II	38	38
III	37	37
Subtotals, Creatives	37	38
IV	36.5	38
Totals	37	38

Table 6. Number of Nominations of Teachers Significantly Affecting Creative Development of Scientists

	Psychologists							Chemists							Totals				Grand Totals	
					Totals							Totals								
	Graduate		Undergrd				Both	Graduate		Undergrd				Both	Graduate		Undergrad			
Group	Fac	Inh	Fac	Inh	Fac	Inh	F&I	Fac	Inh	Fac	Inh	Fac	Inh	F&I	Fac	Inh	Fac	Inh	Fac	Inh
I	175	7	103	5	278	12	1	130	9	79	10	209	19		305	16	182	15	487	31
II	173	20	103	12	276	32	2	259	21	167	12	426	33	1	432	41	270	24	702	65
III	74	7	39	6	113	13	6	62	7	39	1	101	8		136	14	78	7	214	21
Subtotals, Creatives	422	34	245	23	667	57		451	37	285	23	736	60		873	71	530	46	1403	117
IV	301	57	186	18	487	75	3	294	29	215	36	509	65		595	86	401	54	996	140
Grand Totals	723	91	431	41	1154	132	12	745	66	500	59	1245	125	1	1468	157	931	100	2399	257

development, descriptive information was requested for each of these persons. A total of 614 (86%) of the scientists responded to this request, producing 614 nominations and descriptions of teachers having had the most facilitating effect on their development, and 180 nominations and descriptions of teachers having had significant inhibiting effects. Further details of the nominations are provided in Table 7.

The final nominations of the most influential facilitating teachers and all significant inhibiting teachers included a large number of teachers nominated by more than one person. Interestingly, a few of the nominations were positive from one nominee, and negative from another. The actual number of individual teachers nominated totaled 671. These teachers, when contacted and asked to complete the questionnaires previously described, were very receptive. A total of 492 persons returned the completed questionnaire in usable form, representing a 73% response. Further details of the respondents are provided in Tables 8-14.

Methods of Analyses

For purposes of analysis, the groups of subjects were seen as representing a continuum, with those teachers falling at the bottom who exerted an inhibiting influence on the most highly creative group of scientists, and continuing through to the top group, composed of teachers who facilitated the creative development of those scientists whose work was rated as the most highly creative. Thus the total scale fell into the following order: Inhibiting Teachers I, II, III, IV; Facilitating Teachers IV, III, II, I, with only Facilitating Teachers III, II, and I considered to be creative persons. In all analyses, facilitating teachers in all fields nominated for undergraduate and for graduate teaching were first considered together, and then the subgroups were considered separately. Significant tests of significance between subgroups have been reported, however, only in cases in which the N of each subgroup equalled 20 or more.

Means and standard deviations were computed for each subgroup for Factors A, C, E, G, and Q_2 (from the 16 Personality-Factor Scales), the Initiative Scale (from the Ghiselli Self-Description Inventory), and the Barron-Welsh Art Scale. The Vocational/Personal Data were tabulated, and ranges and medians were obtained for items 7 and 11. Tests of significance used throughout, except for frequency data, were t tests and Pearson r's where appropriate. Vocational/Personal Data items 1-6, as well as items 1-47 on the Inventory of Teaching Factors were tested for significance using chi square. Response options in the Inventory of Teaching Factors were combined so as to compare dichotomous responses (example: "almost always" and "usually" combined and compared with "occasionally" and "seldom or never" combined) or in some cases, high and low responses were compared with the intermediate response option omitted. Table 15 indicates the exact options used in each comparison.

Items 48, 49, and 50 from the Inventory of Teaching Factors were write-in items, and these were categorized and tabulated. No significance tests were used on these data.

Table 7. Number of Most Influential Teachers* Described by Scientists

	Psychologists						Chemists						Totals				Grand Totals	
	Graduate		Undergrad		Totals		Graduate		Undergrad		Totals		Graduate		Undergrad			
Group	Fac	Inh	Fac	Inh	Fac	Inh	Fac	Inh	Fac	Inh	Fac	Inh	Fac	Inh	Fac	Inh	Fac	Inh
I	56	7	9	5	65	12	47	7	7	8	54	15	103	14	16	13	119	27
II	64	9	6	4	70	13	87	23	31	10	118	33	151	32	37	14	188	46
III	30	6	4	6	34	12	21	4	4	2	25	6	51	10	8	8	59	18
Subtotals, Creatives	150	22	19	15	169	37	155	34	42	20	197	54	305	56	61	35	366	91
IV	105	40	28	10	133	50	77	22	38	17	115	39	182	62	66	27	248	89
Grand Totals	255	62	47	25	302	87	232	56	80	37	312	93	487	118	127	62	614	180

*Facilitating Teachers include only those nominated as having had the most significant effect; Inhibiting Teachers includes all having had significant effects.

Table 8. Number of Teachers Returning Questionnaires

	Psychologists								Chemists								Totals						Grand Totals	
	Graduate		Undergrad		Not Defined		Totals		Graduate		Undergrad		Not Defined		Totals		Graduate		Undergrad		Not Defined			
Group	Fac	Inh	Fac	Inh	Fac	Inh	Fac	Inh	Fac	Inh	Fac	Inh	Fac	Inh	Fac	Inh	Fac	Inh	Fac	Inh	Fac	Inh	Fac	Inh
I	11	4	5	2	9	3	25	9	18	1	2	2	9	3	29	6	29	5	7	4	18	6	54	15
II	25	4	1	0	17	4	43	8	23	10	13	1	26	1	62	12	48	14	14	1	43	5	105	20
III	9	2	2	3	4	3	15	8	10	1	0	1	1	1	11	3	19	3	2	4	5	4	26	11
Subtotals, Creatives	45	10	8	5	30	10	83	25	51	12	15	4	36	5	102	21	96	22	23	9	66	15	185	46
IV	33	16	9	4	20	20	62	40	23	8	14	6	21	4	58	18	56	24	23	10	41	24	120	58
Grand Totals	78	26	17	9	50	30	145	65	74	20	29	10	57	9	160	39	152	46	46	19	107	39	305	104

Notes--1. Numbers indicate actual number of persons within each category who completed and returned the questionnaires.

2. Teachers nominated by one or more scientists in the creative and the normative groups are classified as double group members; total N of these groups = 83, bringing the total sample size to 492.

3. Due to anonymity of response, combined with a coding error, not all returns were able to be categorized as graduate or undergraduate.

Table 9. Education of Teachers Returning Questionnaires

Group	Psychologists		Chemists	
	Facilitating	Inhibiting	Facilitating	Inhibiting
I				
Doctorate	25	9	27	5
Less Than Doctorate	0	0	0	1
II				
Doctorate	41	7	57	12
Less Than Doctorate	2	1	1	0
III				
Doctorate	15	8	11	3
Less Than Doctorate	0	0	0	0
Sub-Totals, Creatives				
Doctorate	81	24	95	20
Less Than Doctorate	2	1	1	1
IV				
Doctorate	60	37	55	18
Less Than Doctorate	2	3	0	0
Grand Totals				
Doctorate	141	61	150	38
Less Than Doctorate	4	4	1	1

Note--Table entries represent actual numbers of persons responding to item 8, Vocational/Personal Data

Table 10. Faculty Rank of Teachers Returning Questionnaires

	Psychologists		Chemists	
Group	Fac	Inh	Fac	Inh
I				
Professor	22	6	26	6
Associate Professor	3	2	1	0
Assistant Professor	0	0	0	0
Other	0	0	0	0
II				
Professor	34	6	52	7
Associate Professor	5	1	6	5
Assistant Professor	0	0	0	0
Other	2	0	0	0
III				
Professor	14	7	11	1
Associate Professor	1	0	0	1
Assistant Professor	0	0	0	0
Other	0	0	0	0
Sub-Totals Creatives				
Professor	70	19	89	14
Associate Professor	9	3	7	6
Assistant Professor	0	0	0	0
Other	2	0	0	0
IV				
Professor	57	32	45	14
Associate Professor	2	4	8	4
Assistant Professor	2	0	0	0
Other	0	1	1	0
Totals				
Professor	127	51	134	28
Associate Professor	11	7	15	10
Assistant Professor	2	0	0	0
Other	2	1	1	0

Note--Table entries represent actual numbers of persons responding to item 10, Vocational/Personal Data

Table 11. Median Ages of Teachers Returning Questionnaires

	Psychologists		Chemists	
Group	Fac	Inh	Fac	Inh
I	48	51	52	59
II	50	50	50	46
III	48	58	53	48
Sub-Totals, Creatives	49	51	51	51
IV	51	50	51	55
Totals	49	50	52	55

Note--Medians based on data obtained from item 7,
Vocational/Personal Data

Table 12. Areas of Specialization of Teachers Returning Questionnaires -- Psychologists

	Areas							
Group	Gen'l/Exp'l		Clin/Couns		Soc/Indus		Others	
	Fac	Inh	Fac	Inh	Fac	Inh	Fac	Inh
I	20	6	0	0	3	2	2	1
II	23	3	6	3	3	0	9	1
III	7	3	3	1	1	1	3	2
Sub-Totals, Creatives	50	12	9	4	7	3	14	4
IV	14	9	24	13	11	6	11	7
Totals	64	21	33	17	18	9	25	11

Note--Table entries represent actual numbers of persons responding to item 9, Vocational/Personal Data

Table 13. Areas of Specialization of Teachers Returning Questionnaires -- Chemists

Group	Areas									
	Organic		Inorganic		Physical		Analytical		Biochemical	
	Fac	Inh	Fac	Inh	Fac	Inh	Fac	Inh	Fac	Inh
I	6	0	2	0	9	3	2	1	3	2
II	9	2	2	0	11	3	4	1	21	6
III	2	0	0	0	3	0	0	0	5	0
Sub-Totals, Creatives	17	2	4	0	23	6	6	2	29	8
IV	13	6	6	1	11	6	6	1	6	2
Totals	30	8	10	1	34	12	12	3	35	10

Note--Table entries represent actual numbers of persons responding to item 9, Vocational/Personal Data

Table 14. Productivity of Teachers Returning Questionnaires

Group and Variable	Psychologists		Chemists	
	Fac	Inh	Fac	Inh
I				
Articles	30	39	60	35
Books	0.7	1.4	1.2	0
Patents	0	0	0	2.5
II				
Articles	37	28	43	29
Books	1.3	1.6	0.6	1.5
Patents	0	0	0	0
III				
Articles	33	39	54	10
Books	1.2	2.2	1.5	0
Patents	0	0	1.0	0
Sub-Totals, Creatives				
Articles	34	36	52	26
Books	1.1	1.1	0.9	0
Patents	0	0	0	0
IV				
Articles	31	30	38	22
Books	1.4	1.7	0.6	0.6
Patents	0	0	0	0
Total				
Articles	32	31	46	25
Books	1.0	1.5	1.0	0.8
Patents	0	0	0	0

Note--Productivity figures represent medians based on data obtained from item 11a, Vocational/Personal Data

Table 15. Response Option Combinations for significance testing of Inventory of Teaching Factors data

ITF Item No.	Response Option Combinations	ITF Item No.	Response Option Combinations
1	ab/cd	25	ab/cd
2	ab/de	26	ab/cd
3	a/c	27	ab/cd
4	ab/cd	28	ab/cd
5	ab/c	29	ab/cd
6	ab/cd	30	ab/cd
7	ab/cd	31	ab/cd
8	ab/cd	32	a/c
9	ab/cd	33	a/c
10	ab/cd	34	ab/cd
11	a/c	35	ab/cd
12	a/d	36	ab/cd
13	a/c	37	ab/cd
14	ab/cd	38	ab/cd
15	ab/cd	39	ab/cd
16	ab/cd	40	ab/cd
17	a/c	41	a/c
18	a/c	42	a/c
19	a/c	43	ab/cd
20	a/c	44	ab/c
21	abc/d	45	a/c
22	a/c	46	a/c
23	ab/cd	47	a/c
24	ab/cd		

All statistical analyses (except for items 48, 49, and 50 of the Inventory of Teaching Factors which were hand tabulated) were performed at the University of South Florida Computer Research Center using the IBM 360/65. Programs in the Statistical Package for the Social Sciences were used for tabulations, chi square analyses, and r's. Programs in the Computer Research Center's Statistical Library were used for t tests.

The first analysis tested Hypothesis A (hypothesis 7 from Chambers' (1969) theory): A strong ego, a preference for complexity, esthetic sensitivity, and flexibility in thinking are all essential personality traits for creative work regardless of level, field, or type. The scores from the 16 Personality-Factor, Factor C, were used to measure ego strength, and the scores from the Barron-Welsh Art Scale provided measures of both esthetic sensitivity and a preference for complexity (since complex drawings were chosen most often by esthetically sensitive persons in developing the norms for the scale). No measures of flexibility of thinking were available in this study, since, unfortunately, the reliable and valid measures of this trait contain a number of items which could be construed as an invasion of privacy by the subjects.

To first consider the necessity of these traits for creative behavior, comparisons were made between Facilitating Teachers I, II, and III vs. All Inhibiting Teachers plus Facilitating Teachers IV. A second comparison, to determine extremes, compared Facilitating Teachers I vs. Inhibiting Teachers I. To determine if higher levels of the traits are needed for higher levels of creativity, correlation-coefficients were computed using the data from Facilitating Teachers I, II, III, and IV.

The second analysis tested Hypothesis B (hypothesis 8 from Chambers' (1969) theory): Six other personality traits are essential for high-level creative productivity: initiative, dominance, introversion, independence, perseverance, and a striving for excellence. The Initiative Scale from the Ghiselli Self-Description Inventory provided a measure of initiative, while the 16 Personality-Factor Questionnaire Factor E was used to measure dominance, Factor A for introversion, Factor Q_2 for independence, and Factor G for perseverance. No measures were available for the "striving for excellence" factor.

Since this hypothesis specifies that these traits are necessary for high-level creative work, the scores of Facilitating Teachers I and II were compared to Inhibiting Teachers I, II, III, IV, plus Facilitating Teachers III and IV. Three other comparisons were also made, between Facilitating Teachers I and II vs. III and IV, between Facilitating Teachers I and Inhibiting Teachers I, and between Facilitating Teachers I and Facilitating Teachers IV.

To determine if greater degrees of the traits are essential for greater degrees of creativity, correlation-coefficients were computed, using the data from Facilitating Teachers I, II, III, and IV.

The third analysis developed overall comparisons of facilitating vs. inhibiting teachers, using data obtained from the Inventory of Teaching Practices to provide information concerning student/teacher relationships in and out of the classroom, and using the above tests to compare personality profiles.

The final analysis compared psychologists and chemists, using all data gathered, to determine differences in types of student/teacher relationships that develop within each field, and to compare personality profiles of the two groups.

Testing Hypotheses A and B

Hypotheses A and B were tested in order to help determine if traits found necessary for creative work in research were also necessary for creativity in teaching.

Hypothesis A (hypothesis 7 from Chambers' theory), is as follows: A strong ego, a preference for complexity, esthetic sensitivity, and flexibility in thinking are all essential personality traits for creative work regardless of level, field, or type.

Flexibility in thinking was not considered in this study. Of the analyses pertaining to the remaining factors, only one significant difference was found between groups having a sufficiently large size (N of 20 or more) to warrant reporting. The results of that test are given in Table 16, and indicate that creative psychology teachers have a greater preference for complexity, and are more esthetically sensitive than other psychologists (see Appendix C for test items). No significant correlations were found between the personality factors concerned and the creativity group assignments.

Thus the hypothesis that esthetic sensitivity and a preference for complexity are essential for creative teaching, was given only partial support. No support was provided for the hypothesis that a strong ego is essential for creativity in teaching.

Hypothesis B (hypothesis 8 from Chambers' theory), states: Six other personality traits are essential for high-level creative productivity: initiative, dominance, introversion, independence, perseverance, and a striving for excellence.

The results of the analyses pertaining to this hypothesis are given in Table 17 (significant results are reported only for those comparisons between groups having an N of 20 or more). Items constituting the factors concerned are given in Tables 18-21. As may be noted, the strongest support provided by the study is in relation to the hypothesis that introversion and dominance are necessary for high-level creativity in teaching. Self-sufficiency as a necessary trait for high-level creative teaching was given partial support. No support was given to the hypothesis that initiative is a necessary factor. Further, the data indicated a low level of perseverance to be associated with high-level creativity in teaching, in that the highly creative psychology teachers

Table 16. Testing Hypothesis A--Comparison of Creative Facilitating Teachers with Other Teachers on a Significant Personality Factor

Factor and Group	Creative Facilitating Teachers		Others		t test
	Mean	SD	Mean	SD	
B/W (Esthetic Sensitivity)					
All Psychologists	30.93	13.54	27.34	13.96	2.14*

Note--B/W = Barron-Welsh Art Scale

Ns = 117 and 163
*$p < .05$

Table 17. Testing Hypothesis B--Comparison of Creative Facilitating Teachers with other Teachers on Significant Personality Factors

	Analysis #1					Analysis #2				
	Creative Facilitating Teachers		Others		t test	Creative Facilitating Teachers		Others		t test
Factor and Groups	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
A (Extroversion)										
All Subjects	12.67	5.47	13.85	6.41	2.25*					
All Psychologists	12.78	5.69	14.53	7.00	2.11*					
All Graduates	12.09	5.53	13.61	6.65	2.07*	12.45	6.17	15.44	5.43	2.28*
E (Dominance)										
All Subjects						31.46	6.49	28.75	7.33	2.32*
All Graduates						32.14	5.51	28.98	7.27	2.03*
Chemistry Graduates						31.33	5.13	26.34	5.24	2.97**
G (Perseverance)										
All Psychologists	20.10	5.83	21.85	5.73	2.41*					
Q_2 (Self-Sufficiency)										
All Undergraduates	28.52	4.51	25.70	5.26	2.40*					
Chemistry Undergraduates	29.15	3.66	26.07	5.35	2.21*					

Notes--1. Analysis #1 compared Facilitating Groups I and II with all other groups; Analysis #2 compared Facilitating Group I with Facilitating Group IV (normative group).

2. N varied from 20 to 333 for individual means.

*p < .05
**p < .0

Table 18. Items Comprising Significant Personality Test

Inventory	Item Number	Item Content
Factor Questionnaire, Factor A (Extroversion)	1	I would rather have a house: a. in a sociable suburb, b. in between, c. alone in the deep woods.
	8	With the same hours and pay, it would be more interesting to be: a. a carpenter or a cook, b. uncertain, c. a waiter in a good restaurant.
	9	I have been elected to: a. only a few offices, b. several, c. many offices.
	16	If I had to choose, I would rather be: a. a forester, b. uncertain, c. a high school teacher.
	17	For special holidays and birthdays, I: a. like to give personal presents, b. uncertain, c. feel that buying presents is a bit of a nuisance.
	24	In starting a useful invention, I would prefer: a. working on it in the laboratory, b. uncertain, c. selling it to people.
	31	It would be more interesting to work in a business: a. talking to customers, b. in between, c. keeping office accounts and records.
	38	If the earnings were the same, I would rather be: a. a lawyer, b. uncertain, c. a navigator or pilot.

Table 18. Items Comprising Significant Personality Test (cont'd)

Inventory	Item Number	Item Content
Factor Questionnaire, Factor A (Extroversion)	44	It would be more intersting to be: a. an artist, b. uncertain, c. a secretary running a club.
	51	If asked to work with a charity drive, I would: a. accept, b. uncertain, c. politely say I'm too busy.
	57	For a vacation I would rather go to: a. a busy holiday town, b. something in between a. and c., c. a quiet cottage off the beaten track.
	64	In a factory, it would be more interesting to be in charge of: a. mechanical matters, b. uncertain, c. interviewing and hiring people.
	65	I would prefer to read a book on: a. travel in outer space, b. uncertain, c. education within the family.
	72	With equal salary, I would enjoy more being: a. a research chemist, b. uncertain, c. a hotel manager (or manageress).
	73	Going around selling things, or asking for funds to help a cause I believe in, is, for me: a. quite enjoyable, b. in between, c. an unpleasant job.
	80	When traveling, I would rather look at the scenery than talk to people. a. true, b. uncertain, c. false.

Table 18. Items Comprising Significant Personality Test (cont'd)

Inventory	Item Number	Item Content
Factor Questionnaire, Factor A (Extroversion)	87	I'd enjoy more being: a. a business office manager, b. uncertain, c. an architect.
	94	It would be more interesting to be an insurance salesman than a farmer. a. yes, b. in between, c. no.
	100	For a pleasant hobby I would rather belong to: a. a photography club, b. uncertain, c. a debating society.
	107	I would enjoy better: a. being in charge of children's games, b. uncertain, c. helping a watchmaker.

Table 19. Items Comprising Significant Personality Test

Inventory	Item Number	Item Content
Factor Questionnaire, Factor E (Dominance)	4	I hold back from criticizing people and their ideas. a. yes, b. sometimes, c. no.
	5	I make smart, sarcastic remarks to people if I think they deserve it. a. generally, b. sometimes. c. never.
	12	An out-dated law should be changed: a. only after considerable discussion, b. in between, c. promptly.
	13	I am uncomfortable when I work on a project requiring quick action affecting others. a. true, b. in between, c. false.
	19	I have some characteristics in which I feel definitely superior to most people a. yes, b. uncertain, c. no.
	20	When I get upset, I try hard to hide my feelings from others. a. true, b. in between, c. false.
	27	The use of foul language, even when it is not in a mixed group of men and women, still disgusts me. a. yes, b. in between, c. no.
	34	I think I am better described as: a. polite and quiet, b. in between, c. forceful.
	41	I occasionally tell strangers things that seem to me important, regardless of whether they ask about them. a. yes, b. in between, c. no.
	46	If the odds are really against something's being a success, I still believe in taking the risk. a. yes, b. in between, c. no.

Table 19. Items Comprising Significant Personality Test (cont'd)

Inventory	Item Number	Item Content
Factor Questionnaire, Factor E (Dominance)	47	I like it when I know so well what the group has to do that I naturally become the one in command. a. yes, b. in between, c. no.
	53	I am known as an "idea man" who almost always puts forward some ideas on a problem. a. yes, b. in between, c. no.
	54	I think I am better at showing: a. nerve in meeting challenges, b. uncertain, c. tolerance of other people's wishes.
	60	If I know that another person's line of reasoning is in error, I tend to: a. keep quiet, b. in between, c. speak out.
	61	My ideas appear to be: a. ahead of the times, b. uncertain, c. with the times.
	68	I like to avoid saying unusual things that embarrass people. a. true, b. in between, c. false.
	69	If I had a gun in my hand that I knew was loaded, I would feel nervous until I unloaded it. a. yes, b. in between, c. no.
	75	In a strange city, I would: a. walk wherever I liked, b. uncertain, c. avoid the parts of the town said to be dangerous.
	76	It is more important to: a. get along smoothly with people, b. in between, c. get your own ideas put into practice.

Table 19. Items Comprising Significant Personality Test (cont'd)

Inventory	Item Number	Item Content
Factor Questionnaire, Factor E (Dominance)	83	It embarrasses me to have servants waiting on me. a. yes, b. in between, c. no.
	90	If I disagree with a superior on his views, I usually: a. keep my opinion to myself, b. uncertain, c. tell him that my opinion differs.
	97	I honestly think I am more planful, energetic, and ambitious than many perhaps equally successful people. a. yes, b. occasionally, c. no.
	102	Prosecuting lawyers are mainly interested in: a. making convictions, regardless of the person, b. uncertain, c. protecting the innocent.
	103	People have sometimes called me a proud, "stuck-up" individual. a. yes, b. in between, c. no.
	109	I believe that the most important thing in life is to do what I like. a. yes, b. uncertain, c. no.
	110	My speaking voice is: a. strong, b. in between, c. soft.

Table 20. Items Comprising Significant Personality Test

Inventory	Item Number	Item Content
Factor Questionnaire, Factor G (Perseverance)	6	If I saw two neighbors' children fighting, I would: a. leave them to settle it, b. uncertain, c. reason with them.
	14	When I see "sloppy" untidy people, I: a. just accept it, b. in between, c. get disgusted and annoyed.
	21	I think that plenty of freedom is more important than good manners and respect for the law. a. true, b. uncertain, c. false.
	28	People sometimes call me careless, even though they think I'm a likable person. a. yes, b. in between, c. no.
	35	In thinking of difficulties in my work, I: a. try to plan ahead, before I meet them, b. in between, c. assume I can handle them when they come.
	42	I find the sight of an untidy room very annoying. a. yes, b. in between, c. no.
	48	I close my mind to well-meant suggestions of others, even though I shouldn't. a. occasionally, b. hardly ever, c. never.
	49	I always make it a point, in deciding anything, to refer to basic rules of right and wrong. a. yes, b. in between, c. no.

Table 20. Items Comprising Significant Personality Test (cont'd)

Inventory	Item Number	Item Content
Factor Questionnaire, Factor G (Perseverance)	55	I am a fairly strict person, insisting on always doing things as correctly as possible. a. true, b. in between, c. false.
	56	I enjoy work that requires conscientious, exacting skills. a. yes, b. in between, c. no.
	62	It is better to live to a ripe old age than to be worn out with good services for one's community. a. true, b. in between, c. false.
	70	People use up too much of their leisure in neighborly duties and helping with local affairs. a. yes, b. uncertain, c. no.
	77	When given a set of rules, I follow them when personally convenient, rather than exactly to the letter. a. true, b. uncertain, c. false.
	84	At work it is really more important to be popular with the right people than to do a first-rate job. a. true, b. in between, c. false.
	91	I enjoy giving my best time and energy to: a. my home and the real needs of my friends, b. in between, c. social activities and personal hobbies.
	98	I find it desirable to make plans to avoid waste of time between jobs. a. yes, b. in between, c. no.
	104	When I do something, my main concern is that: a. it is really what I want to do, b. uncertain, c. there will be no bad results for my associates.

Table 20. Items Comprising Significant Personality Test (cont'd)

Inventory	Item Number	Item Content
Factor Questionnaire, Factor G (Perseverance)	105	I think most stories and movies should teach us a good moral. a. true, b. in between, c. false.
	111	I greatly dislike the sight of disorder. a. true, b. uncertain, c. false.
	112	I always check very carefully the condition in which borrowed property is returned, to me or by me to others. a. yes, b. in between, c. no.

Table 21. Items Comprising Significant Personality Test

Inventory	Item Number	Item Content
Factor Questionnaire, Factor Q_2	7	Most people would be happier if they lived more with their fellows and did the same things as others. a. yes, b. in between, c. no.
	15	As a teenager, I joined in school sports: a. occasionally, b. fairly often, c. a great deal.
	22	I would prefer to have an office of my own, not sharing it with another person. a. yes, b. uncertain, c. no.
	23	I would rather enjoy life quietly in my own way than be admired for my achievements. a. true, b. uncertain, c. false.
	29	To keep informed, I like: a. to discuss issues with people, b. in between, c. to rely on the actual news reports.
	30	I like to take an active part in social affairs, committee work, etc. a. yes, b. in between, c. no.
	36	It bothers me if people think I am being to unconventional or odd. a. a lot, b. somewhat, c. not at all.
	37	In constructing something I would rather work: a. with a committee, b. uncertain, c. on my own.
	43	I like to do my planning alone, without interruptions and suggestions from others. a. yes, b. in between, c. no.

Table 21. Items Comprising Significant Personality Test (cont'd)

Inventory	Item Number	Item Content
Factor Questionnaire, Factor Q_2	50	I learn better by: a. reading a well-written book, b. in between, c. joining a group discussion.
	63	I have, compared with others, participated in: a. many community and social activities, b. several, c. only a few community and social activities.
	71	I find books more entertaining than companions. a. yes, b. in between, c. no.
	78	My friends probably think it is hard to get to know me really well. a. yes, b. in between, c. no.
	79	I solve a problem better by: a. studying it alone, b. in between, c. discussing it with others.
	85	In planning social outings, I: a. am always happy to commit myself entirely, b. in between, c. like to reserve the right to cancel my going.
	86	Many people talk over their problems and ask advice of me when they need someone to talk to. a. yes, b. in between, c. no.
	92	I like my acquaintances to think of me as one of the group. a. true, b. in between, c. false.
	93	When looking for a place in a strange city, I would: a. just ask people where places are, b. in between, c. take a map with me.

Table 21. Items Comprising Significant Personality Test (cont'd)

Inventory	Item Number	Item Content
Factor Questionnaire, Factor Q_2	99	When I do what I want, I find I'm generally: a. understood only by close friends, b. in between, c. doing what most people think is O.K.
	106	I get as many ideas from reading a book myself as from discussing its topics with others. a. yes, b. in between, c. no.

scored lower on this factor than the less creative psychology teachers. This will be considered further in the discussion section (Note--the factor "a striving for excellence was not considered in this analysis).

Table 22 presents the significant correlations between the personality tests concerned and creativity group assignments. These analyses tended to provide further support for the hypotheses that the traits of introversion, dominance, and self-sufficiency are necessary for high-level creative productivity in teaching.

Table 22. Testing Hypothesis B--Correlations between Personality Factors and Creativity Group Assignments

Factor and Group	Pearson r
A (Extroversion)	
All Subjects	+ .12*
All Psychologists	+ .15*
All Graduates	+ .20**
Psychology Graduates	+ .19*
E (Dominance)	
All Subjects	- .12*
All Chemists	- .23**
All Graduates	- .14*
Chemistry Graduates	- .28**
Q_2 (Self-Sufficiency)	
All Chemists	+ .14*

Notes--1. All facilitating groups (I, II, III, IV) were used in these analyses.
2. N varied from 74 to 305.

* < .05
** < .01

Comparison of Facilitating and Inhibiting Teachers Teachers As Described by Students

Table 23 indicates those items from the Inventory of Teaching Factors which were found to significantly differentiate those teachers who facilitated creative behavior from those who inhibited such behavior. In all such comparisons, the significant findings were in the same direction.

In regard to classroom activities, the facilitating teachers as contrasted to the inhibiting teachers, more often conducted classes in an informal, "free wheeling" manner in which students were often asked to state their preferences regarding topics to be covered in class. They usually were well prepared for class, and less often relied on materials from the assigned texts for lectures. Similarily, they were less inclined to read directly from notes or books. In lecturing, these faculty members more often used language that the students understood. When students disagreed with them, they more often used this as a springboard for class discussions.

Emphasis in the classroom was more often placed on helping students to understand principles, and examinations were used as aids to learning and as evaluation tools. The facilitating teachers more often conveyed penetrating insights into problems, and rewarded similar responses from students. Different, or unorthodox views were more often welcome to be aired in the classroom, and in general, these teachers more often rewarded student initiative, originality and creativity.

The students viewed the facilitating teachers as more often personally interested in teaching and in their students, and as having a high level of commitment to their field. The students' image of these teachers was of a hard-driving, dynamic individual who was very intellectually demanding of students.

Outside of the classroom, the facilitating teachers were more often available to students. They encouraged students to come to them to discuss class-related matters, and sometimes even for help on personal matters. However, they seldom encouraged dependent relationships.

On all of the above factors, the data indicated that facilitating teachers exhibited a greater or lesser degree of the specific traits than inhibiting teachers. A number of items, however, showed facilitating teachers to be almost completely the opposite of the inhibiting teachers. In the classroom, facilitating teachers strongly encouraged student participation in class discussions, while inhibiting teachers discouraged participation and would not tolerate students disagreeing with the instructor. When facilitating teachers did not know answers to questions, they had little or no difficulty in admitting it, whereas inhibiting teachers had great difficulty.

Facilitating teachers seemed mainly concerned in the classroom with the understanding of general principles. They appeared to be greatly concerned with stimulating students to want to learn more on their own,

Table 23. Comparison of All Facilitating and Inhibiting Teachers on Significant Items, Inventory of Teaching Factors

Item No.	Group				Item Content
	I	II	III	IV	
1	10.90	11.70		19.85	Classes were generally conducted in the following type of atmosphere: a. very informal b. moderately informal c. fairly formal d. severely formal
3	55.94	81.61	17.86	91.53	Student participation in class discussions: a. was strongly encouraged b. was moderately encouraged c. was discouraged
4	4.33*	5.27*		8.52	Students were asked to state their preferences as to topics to be covered in class: a. almost always b. usually c. occasionally d. seldom or never
5				6.42*	Students were asked to criticize the instructor's teaching: a. on a class-to-class basis b. on a periodic basic c. seldom or never
6	6.31*	13.63	5.26*	35.62	The teacher relied on materials from the assigned texts for his lectures: a. almost always b. usually c. occasionally d. seldom or never
7	15.26	53.75	9.64	46.94	The faculty member read his lectures directly from notes or from books: a. almost always b. usually c. occasionally d. seldom or never
8		18.78		30.78	The instructor was well prepared for class: a. almost always b. usually c. occasionally d. seldom or never

Notes--1. All item responses were tested for significance using chi square.

2. $p < .01$ except those values starred (*), in which case $p < .05$.

Table 23. Comparison of All Facilitating and Inhibiting Teachers on Significant Items, Inventory of Teaching Factors (cont'd)

Item No.	Group				Item Content
	I	II	III	IV	
9				15.54	The teacher tended to lecture over the students' heads: a. almost always b. usually c. occasionally d. seldom or never
10		19.45		11.64	The faculty member used language in the classroom that the students understood: a. almost always b. usually c. occasionally d. seldom or never
11	70.76	116.00	32.09	148.88	When the teacher did not know the answer to a question: a. he had great difficulty in admitting it b. he had some difficulty in admitting it c. he had little or no difficulty in admitting it
12	38.84	30.89		40.52	I regarded the faculty member as: a. an outstanding national scholar in his field b. an authority in his field locally c. teacher of average academic preparation in his field d. a person lacking adequate knowledge of his field
13	21.69	43.75	12.85	42.51	The teacher seemed to have: a. a high level of commitment to his field b. a moderate level of commitment to his field c. a low level of commitment to his field
14	65.59	97.37	19.27	120.69	When students disagreed with the teacher, he reacted in a negative way indicating his intolerance of disagreement: a. almost always b. usually c. occasionally d. seldom or never

Notes--1. All item responses were tested for significance using chi square.

2. $p < .01$ except those valuesstarred (*), in which case $p < .05$.

Table 23. Comparison of All Facilitating and Inhibiting Teachers on Significant Items, Inventory of Teaching Factors (cont'd)

Item No.	Group				Item Content
	I	II	III	IV	
15	25.37	49.30	5.86*	91.31	When students disagreed with the instructor he reacted in a positive way, using such disagreements as a springboard for class discussions, debates, etc.: a. almost always b. usually c. occasionally d. seldom or never
16	37.30	126.12	40.00	172.41	The teacher seemed personally interested in teaching and in his students: a. almost always b. usually c. occasionally d. seldom or never
17	25.16	58.64	6.77	85.10	To what extent was class emphasis placed on memorization of materials: a. large extent b. moderate extent c. small extent
18	43.23	127.23	19.96	114.33	To what extent was class emphasis placed on helping students to understand principles: a. large extent b. moderate extent c. small extent
19	54.36	114.26	31.75	171.26	To what extent was class emphasis placed on stimulating students to want to learn more on their own: a. large extent b. moderate extent c. small extent
20		10.10		4.61*	Classes were: a. highly structured b. moderately structured c. rather unstructured and "free wheeling"
21	7.97	15.15		27.73	Examinations were used: a mainly as aids to learning b. mainly as evaluation tools c. a combination of a and b d. mainly as tools to control the students e. none of the above

Notes--1. All item responses were tested for significance using chi square.

2. $p < .01$ except those values starred (*), in which case $p < .05$.

Table 23. Comparison of All Facilitating and Inhibiting Teachers on Significant Items, Inventory of Teaching Factors (cont'd)

Item No.	Group I	Group II	Group III	Group IV	Item Content
22				15.07	Attendance in class as far as the instructor was concerned: a. was relatively unimportant b. was moderately important c. was very important
23	49.16	108.58	36.67	106.67	Initiative on the part of students: a. was strongly rewarded b. was moderately rewarded c. was somewhat discouraged d. was strongly discouraged
24	8.99	24.22	3.85*	40.26	Students giving good answers to questions in the classroom were complimented: a. almost always b. usually c. occasionally d. seldom or never
25	50.38	101.17	41.56	128.30	Originality and creativity on the part of students: a. was strongly rewarded b. was moderately rewarded c. was somewhat discouraged d. was strongly discouraged
26	43.62	71.18	26.08	143.03	In the classroom, the teacher demonstrated originality and creativity: a. almost always b. usually c. occasionally d. seldom or never
27	56.76	99.90	32.66	113.35	In the classroom, the teacher demonstrated a high level of enthusiasm about course material: a. almost always b. usually c. occasionally d. seldom or never
28	20.65	64.40	12.15	82.69	In the classroom, the instructor conveyed brilliant and penetrating insights into problems: a. almost always b. usually c. occasionally d. seldom or never

Notes--1. All item responses were tested for significance using chi square.

2. $p < .01$ except those values starred (*), in which case $p < .05$.

Table 23. Comparison of All Facilitating and Inhibiting Teachers on Significant Items, Inventory of Teaching Factors (cont'd)

Item No.	Group				Item Content
	I	II	III	IV	
29	63.10	128.14	33.80	168.39	In the classroom, the teacher demonstrated a high level of enthusiasm about learning in general: a. almost always b. usually c. occasionally d. seldom or never
30	76.15	124.82	23.41	131.58	The instructor encouraged independent study on the part of students: a. almost always b. usually c. occasionally d. seldom or never
32	43.08	86.39	11.38	66.18	The faculty member was: a. very intellectually demanding of his students b. moderately intellectually demanding of his students c. required very little intellectual activity of his students
33	11.28	51.37	13.27	51.79	The image the teacher presented was of a: a. hard-driving, dynamic person b. moderately ambitious person c. rather lazy person
34				4.97*	In the classroom, the instructor expressed strong views on matters: a. almost always b. usually c. occasionally d. seldom or never
36	18.81	38.30	11.19	71.29	In dealing with students in the classroom, the teacher relied heavily on cynicism and sarcasm or in other ways attempted to embarrass students: a. almost always b. usually c. occasionally d. seldom or never

Notes--1. All item responses were tested for significance using chi square.

2. $p < .01$ except those values starred (*), in which case $p < .05$.

Table 23. Comparison of All Facilitating and Inhibiting Teachers on Significant Items, Inventory of Teaching Factors (cont'd)

Item No.	Group				Item Content
	I	II	III	IV	
37	21.04	42.83	4.76*	101.41	Different or unorthodox views were welcome to be aired in his classroom: a. almost always b. usually c. occasionally d. seldom or never
38	18.79	90.09	6.78	99.84	The instructor encouraged students to come to him to discuss class-related matters: a. almost always b. usually c. occasionally d. seldom or never
39		19.73		26.38	The teacher encouraged students to come to him for help on personal matters: a. almost always b. usually c. occasionally d. seldom or never
40	22.57	48.79		120.99	The faculty member was available to students outside of the classroom: a. almost always b. usually c. occasionally d. seldom or never
41	33.97	76.84	12.15	86.44	Outside of the classroom, the teacher spent the following amounts of time in discussions with students about intellectual matters: a. a great deal of time b. a moderate amount of time c. very little or no time
42	43.12	102.30	30.27	157.88	The instructor seemed to be: a. personally interested in each student b. personally interested in some students c. relatively uninterested in most or all students

Notes--1. All item responses were tested for significance using chi square.

2. $p < .01$ except those values starred (*), in which case $p < .05$.

Table 23. Comparison of All Facilitating and Inhibiting Teachers on Significant Items, Inventory of Teaching Factors (cont'd)

Item No.	Group				Item Content
	I	II	III	IV	
43	70.69	170.08	26.46	251.43	The teacher encouraged students to be independent thinkers: a. almost always b. usually c. occasionally d. seldom or never
44	31.24	15.19		52.62	The teacher encouraged a dependent relationship on the part of his students: a. almost always b. usually c. occasionally d. seldom or never
45	7.48				Generally speaking, the teacher seemed to be: a. more interested in research than teaching b. equally interested in both teaching and research c. more interested in teaching than research
46	27.30	16.38	4.35*	15.21	In regard to his research, I considered the faculty member to be: a. an outstanding national researcher b. a researcher of good local reputation c. more of a teacher than a researcher
47	68.91	91.16	30.16	154.89	The teacher in his daily life showed the following amount of enthusiasm for learning and intellectual matters: a. a great amount b. a moderate amount c. little or none

Notes--1. All item responses were tested for significance using chi square.

2. p < .01 except those values starred (*), in which case p < .05.

and they encouraged students to do independent study. These teachers were highly enthusiastic about their fields and about learning in general, and continually demonstrated their own originality and creativity.

In contrast, inhibiting teachers were mainly concerned in the classroom with memorization of materials. They de-emphasized independent study. They were generally unenthusiastic, boring teachers who seldom showed any originality or creativity in the classroom. They routinely relied on cynicism and sarcasm to handle students.

Outside of class, the same traits exhibited by the two groups in the classroom came to the fore. Facilitating teachers again proved to be exciting people, interested in students and learning in general, who spent large amounts of time with students, and who encouraged them to be intellectually independent. Inhibiting teachers, on the other hand, appeared relatively uninterested in students and learning, and spent little time with the students outside of the classroom.

Finally, the students regarded the facilitating teachers as outstanding scholars in their field, having strong national research reputations. Conversely, the inhibiting teachers were seen as persons lacking knowledge in their field, and as "more teachers than researchers."

The above comparisons held true fairly uniformly when comparing facilitating to inhibiting teachers at all group levels. To put it another way, the same kinds of teacher behaviors and attitudes, both in and out of the classroom, seemed to be important in the strengthening or weakening of creativity, whether the potential ability of the students for creative research was high or low.

A few exceptions to the above were found, however. The major exception was in reference to the research orientation of the faculty member. Thus, the most highly creative scientists were found to have been most influenced by those teachers who were more interested in research than teaching. This relationship, however, was not found with any other group.

With the above exception, comparisons of facilitating and inhibiting teachers within all three creative groups conformed reasonably well to the preceding descriptions. The facilitating and inhibiting teachers in the normative groups, however, differed in several additional ways, mainly indicative of greater student orientation on the part of the teachers. Thus, facilitating teachers often asked students to criticize their teaching, and they seldom lectured over the students' heads. In addition, they quite often expressed strong views on matters. Finally, classroom attendance was considered relatively unimportant.

The above descriptions were based on items 1-47 of the Inventory of Teaching Factors, with analyses based on all psychologists and chemists combined within each of the four groups. Due to the small size of the inhibiting teacher groups when considered field by field, by individual or creativity group, and due to the general significance of the findings at the overall level, separate analyses of chemistry and psychology teachers will not be reported, nor will separate analyses of graduate and undergraduate teachers. A cursory examination of the computer printouts of the tests of significance between these groups, however, indicated that the general findings reported above held throughout.

The final three items on the Inventory of Teaching Factors were write-in items in which the subjects were asked to describe the important things in the relationships between themselves and the teachers they nominated, which significantly affected their creative development and which had not been adequately covered by the preceding items. Scientists were further asked to cite specific incidents in which the nominated teachers contributed to their development as creative persons. The results of the analyses of these write-in items are presented in Tables 24-27.

Tables 24 and 25 present the picture of the facilitating teacher which supplements, but in no way contradicts the results obtained from first 47 items of the Inventory of Teaching Factors. Although the factors have been briefly identified in the tables, each is considerably broader than the title indicates, and the key factors merit further amplification. The facets of the factors can be readily seen in the following critical incidents or other comments from the narratives of the subjects:

Facilitating Factor #1. Treated students as individuals; offered encouragement.

> "He encouraged me to begin research at an early point in my development. He encouraged me to publish and to give papers independently. He sometimes fed me when I was broke and hungry. The most important factor was on the emotional side. He always positively reinforced my image of myself. He consistently said 'you can do it, your ideas are good, you will make a contribution.' The fact that he was somewhat selective in this, not reinforcing all students in this way, made this quite important to me. Gradually I began to believe him, well, at least a little."
>
> --a creative psychologist

> "I went to Professor ---- to seek a 'dishwasher' job in the summer after my junior year. He trusted me enough to have me do research in his group. This event, in addition to his inspiring teaching the year before, clearly blazed the trail which I was to follow."
>
> --a creative chemist

Table 24. Significant Factors* in Student-Teacher Relationships Affecting Creative Development of Scientists, Creative Groups

Rank Order	Factor	Psychologists Grad	Psychologists Undg	Psychologists Tot	Chemists Grad	Chemists Undg	Chemists Tot	Totals Grad	Totals Undg	Grand Totals
1	Treated students as individuals; offered encouragement	43	5	48	49	13	62	92	18	110
2	Encouraged students to be independent	38	5	43	39	11	50	77	16	93
3	Teacher served as a model	36	2	38	22	10	32	58	12	70
4	Teacher spent considerable amount of time with students outside of class	27	3	30	15	6	21	42	9	51
5	Teacher indicated that excellence was expected and could be achieved	27	1	28	16	7	23	43	8	51
6	Teacher's enthusiasm	18	1	19	22	9	31	40	10	50
7	Students accepted by teacher as equals	24	1	25	9	0	9	33	1	34
8	Teacher directly rewarded student's creative behavior or work	18	1	19	9	1	10	27	2	29
9	Teacher was interesting, dynamic lecturer	4	1	5	7	4	11	11	5	16
10	Teacher was not good in classroom, but excellent on one-to-one basis	8	0	8	3	0	3	11	0	11

*Factors indicated as significant by more than ten persons in all creative groups combined.
Note--Numbers indicate the actual number of persons listing this factor as of prime importance.

Table 25. Significant Facilitating Factors* in Student-Teacher Relationships Affecting Creative Development of Scientists, Normative Groups

Rank Order	Factor	Psychologists			Chemists			Totals		Grand Totals
		Grad	Undg	Tot	Grad	Undg	Tot	Grad	Undg	
1	Treated students as individuals; offered encouragement	37	12	49	17	13	30	54	25	79
2	Encouraged students to be independent	20	3	23	28	7	35	48	10	58
3	Teacher served as a model	21	6	27	14	5	19	35	11	46
4	Teacher spent considerable amount of time with students outside of class	17	3	20	14	6	20	31	9	40
5	Teacher indicated that excellence was expected and could be achieved	17	2	19	8	5	13	25	7	32
6	Teacher's enthusiasm	8	2	10	13	7	20	21	9	30
7	Teacher was interesting, dynamic lecturer	9	3	12	3	1	4	12	4	16
8	Teacher directly rewarded student's creative behavior or work	9	3	12	3	1	4	12	4	16

*Factors indicated as significant by more than ten persons with both normative groups combined.
Note--Numbers indicate the actual number of persons listing this factor as of prime importance.

Table 26. Significant Inhibiting Factors* in Student-Teacher Relationships Affecting Creative Development of Scientists, Creative Groups

Rank Order	Factor	Psychologists			Chemists			Totals		Grand Totals
		Grad	Undg	Tot	Grad	Undg	Tot	Grad	Undg	
1	Teacher discouraged students (ideas, creativity, etc.)	4	5	9	4	4	8	8	9	17
2	Teacher was insecure (hypercritical, sarcastic)	6	1	7	4	0	4	10	1	11
3	Teacher lacked enthusiasm	2	1	3	2	4	6	4	5	9
4	Rote learning was emphasized	0	0	0	3	4	7	3	4	7
5	Teacher was dogmatic and rigid	2	1	3	4	0	4	6	1	7
6	Teacher did not keep up with field; generally incompetent	1	0	1	2	2	4	3	2	5
7	Teacher had narrow interests; was a narrow person	1	1	2	2	1	3	3	2	5

*Factors indicated as significant by more then two persons with all creative groups combined.
Note--Numbers indicate the actual number of persons listing this factor as of prime importance.

Table 27. Significant Inhibiting Factors* in Student-Teacher Relationships Affecting Creative Development of Scientists, Normative Groups

Rank Order	Factor	Psychologists			Chemists			Totals		Grand Totals
		Grad	Undg	Tot	Grad	Undg	Tot	Grad	Undg	
1	Teacher discouraged students (ideas, creativity, etc.)	14	1	15	3	2	5	17	3	20
2	Teacher was insecure (hypercritical, sarcastic)	7	0	7	1	2	3	8	2	10
3	Teacher was dogmatic and rigid	6	2	8	0	1	1	6	3	9
4	Teacher did not keep up with field; generally incompetent	3	2	5	1	0	1	4	2	6
5	Teacher lacked enthusiasm	2	1	3	1	1	2	3	2	5
6	Teacher had narrow interests; was a narrow person	1	1	2	2	0	2	3	1	4
7	Teacher was not available outside the classroom	1	1	2	1	0	1	2	1	3
8	Rote learning was emphasized	2	0	2	0	1	1	2	1	3

*Factors indicated as significant by more than two persons with both normative groups combined.
Note--Numbers indicate the actual number of persons listing this factor as of prime importance.

"Professor ---- was one of the giants in the field. On the surface he was neither warm nor very approachable. It was only because I found out in his class that our biases matched (both strongly anti-behavioristic) that I had enough courage to approach him. I offered to be of some assistance in a research project. Since then we have had an intimate relationship. We still write to each other and discuss matters of most personal concern as well as intellectual matters and academic gossip...I guess that in part I am insisting that some teachers can only positively influence the students with whom they have personal contact. I am also wondering how many seemingly reserved teachers must wait until brash students intrude on them before they can offer of their substance. Somewhere in all of this I am also trying to say something corny like 'you can only learn deeply from those you love.'"

--a creative psychologist

"He became a friend who wanted to hear my ideas--thus I worked to have something to say."

--a creative psychologist

Facilitating Factor #2. Encouraged students to be independent.

"He led me to challenge him and our own texts, to challenge a learning authority, for the first time (or at least it was the first time I recall being successful). I remember debating him for 15 minutes during class on the significance in my life of an idea from Goethe's 'Faust'--we each ended having really heard and appreciating each other's views. It was the first time a quiet, analytical, student (me) had dared to oppose a professor on his own ground, and was encouraged...instead of being put down with an air of superiority and the weight of more advanced knowledge which every other professor always used to shut me up. Whether my success was real or imagined, it gave me that spark that I have used for guidance ever since."

--a creative chemist

"The first day that I talked to him about research, he said that I should pick an area that I was interested in, not one that I thought he would be interested in. When a controversy developed between me and a faculty member, he suggested that I should pursue my opinion, and look for support for it."

--a creative psychologist

"He deliberately put me in a position to challenge his views on research problems. I felt that this challenge was a strong driving force to develop creativity. He actually made me antagonize him."

--a chemist from the normative group

Facilitating Factor #3. Teacher served as a model.

"The classroom is bull---- - nearly a waste of time. Important contacts with the teacher which stimulate creative research (in my opinion) come from a kind of master-apprentice relationship which develops outside of any formal classroom structure. Small group meetings, lunches, parties, Sunday afternoon softball games --this is where the feeling for research and the desire to do it creatively is transmitted. Not to fulfill a requirement--get a higher salary--someone's approval--but as a satisfying form of personal expression. Being around someone who loves research somehow transmits love for and ability to do it. Can you get at that?"

--a creative psychologist

"I think this teacher provided a good model for many of the attributes that a scientist should seek to possess and when he didn't an alternate model was clarly stated or indicated. Positive model attributes included: (a) very well read in both breadth and depth; (b) turned on to subject in a dynamic, hard-working, continually inquiring fashion; (c) refused self-imposed and professionally imposed barriers to inquiry--given a problem sought out information and used methods irrespective of discipline or origin or previous experience; (d) encouraged and totally enjoyed vigorous discussion; (e) frankly admitted without bias his limiatations and immediately sought correction; (f) in all things was absolutely honest, committed, and unselfish."

--a creative chemist

"The relation of the great teachers to their graduate students is so close to being a parental one...

Dr.---- was brought up in a particular academic tradition (Wundt-Titchener-Boring-Stevens...) in which the role as graduate mentor is taken very seriously. If the candidate complete his studies under that model, his chairman assumes some degree of life-long responsibility for him...and in return basks in the reflected glory of any of his former students successes. For the student to accept such a relationship must mean an enormous effort on the part of his teacher. Few can carry this off without appearing to either dominate, curry affection, or intrude. Dr.----'s style encouraged intellectual rapport without dispensing with the student-professor relationship. That's a tough act to follow!

"One of Dr.----'s tricks is to advertise his basest motives for anything he does. The upshot is that students are left inducing the purest ones (genuine curiosity, scrupulous scientific honesty, enormous intellectual energy) rather than vice versa. He shares with other first-rank scientists I have known an involvement in his scientific pursuits that continues almost throughout his waking hours. His graduate students generally come to him with the folk lore that he is a genius...after a semester or two they conclude that it isn't so, he simply works his tail off and is extremely well organized, both in his head and in his office. A few semesters later most of us decided that we had seen enough faculty in operation that Dr.----'s vigor and organization were in fact the stuff that genius is of. His classes were enormously well organized...they should have been, he gave his lectures several times to the students in his own lab before going off to the lecture hall with them. But the seminars in which we presented papers to each other were the real training ground... with frequent shouted arguments and no incentive to study except that you wanted to be in on the discussions and to know the facts under consideration. I don't think Dr.---- is a good model if you want to build a perfect faculty member...it requires too much of the individual."

--a creative psychologist

"It seemed to me that this teacher's thinking was so often radically unconventional yet more penetrating then traditional thought that he repre-

> sented a kind of model for developing original ideas of one's own. He did not encourage creative thinking directly in his students; he just thought creatively himself and one was caught up in a kind of 'contagious originality.' In fact he was often quite brutal in exposing the fallacies in thoughts brought up by students, but far from inhibiting originality, this seemed to stimulate it all the more. His brutality had the effect of freeing students from orthodoxy."
>
> --a creative psychologist

Facilitating Factor #4. Teacher spent considerable amount of time with students outside of class.

> "We spent about four hours per week talking about issues related to the course by going to the student coffee shop after class. Without exceptions, these sessions were great - they were the times during which my intellectual style really took shape. We did this for two years."
>
> --a creative psychologist

> "About three or four students, including myself, frequently drank beer at a local tavern with ----. These sessions invariably involved free-wheeling discussions of various chemical, or other scientific, topics. Dr.---- acted as instigator, catalyst, and source material for the discussions."
>
> --a creative chemist

> "He took me to national and regional meetings and stimulated my interaction with other scholars in my field of interest. He spent endless hours in private conversations with me discussing intellectual as well as personal matters."
>
> --a creative psychologist

Facilitating Factor #5. Teacher indicated that excellence was expected and could be achieved.

> "This teacher had the ability to convey to each student the idea that he expected him to succeed professionally. He then gave students sufficient confidence in their mastery of their subject through rigorous training that it became possible to believe you could live up to his expectations.

> It almost reached the point of feeling that you had to succeed just so you wouldn't be a disappointment to him as a teacher."
>
> --a creative chemist

> "----- expected creative and competent work from his students but did not demand it. His students (those he singled out for special attention) tended to develop strong affectional bonds with him and relate to him rather like a father. In turn he did not criticize inadequate performance, but allowed his disappointment to show when his standards for the student were not met. Praise for creativity and competence was subdued and primarily took the form of brief comments to the effect of 'that's pretty much what I expect of you.'"
>
> --a creative psychologist

> "He set himself up as an intellectual giant; to be intellectually like him was a goal worthy of being achieved. He was a demanding person who required students to meet him on his own level."
>
> --a chemist from the normative group

Facilitating Factor #6. Teacher's Enthusiasm

> "For many students, including myself, ---- was the first genuine intellectual we'd encountered. The experience was profound: Here was a man who savored ideas, who excited us about the great debates within psychology, who taught us what science was about. He became an inspiring (if somewhat aloof) model."
>
> --a creative psychologist

> "Dr.---- is an enthusiastic teacher with a primary interest in research. While he always provided reference texts for his class work, he nearly always gave examples from his own research. This approach gave me the feeling I was actually participating in the evolution of this field (in this case, chemistry) rather than simply being involved in a narration of others activities. Dr.---- was always close to his students in the laboratory as well as the classroom. I personally worked to midnight for nearly three years of graduate work. I was not required to do this but did it because

> I knew Dr.---- was across the hall in his own lab ready to assist in a laboratory problem or to impart a new burst of enthusiasm and knowledge if needed. Many of the 'facts' of science he taught have long been forgotten; but I shall never forget the love and enthusiasm for chemistry he imparted to me and his other students."
>
> --a creative chemist

The remaining facilitating factors are of lesser importance and generally speaking, are self-explanatory, so no further details will be given here.

Tables 26 and 27 present the picture of the inhibiting teacher. Although the rank order of the factors differs somewhat for the creative as compared to the normative groups, essentially the same factors appear to be inhibiting to the creative and normative subjects. As in the case of the facilitating factors, the write-in items served mainly to amplify and round out the results obtained from the first 47 items of the Inventory of Teaching Factors, rather than to contradict them.

The following excerpts fromthe narratives of the subjects will serve to illustrate the concepts covered in the key factors.

Inhibiting Factor #1. Teacher discouraged students (ideas, creativity, etc.).

> "About the middle of my graduate studies he strongly advised me to finish with an M.S. degree and seek an industrial job. He was always skeptical of my ability...Upon receiving my Ph.D. he congratulated me on outstanding accomplishments which he thought I would never achieve."
>
> --a creative chemist

> "He blocked the area of inquiry I showed interest in and threatened not to give advanced degree if I did not change. He ridiculed class presentations which may have been naive but well intentioned...He made me fear him by his trying to force me to have his viewpoint and when it was not possible for me to do so because it would have been dishonest on my part he tried to discredit the validity of my reasoning, made me feel stupid and doubtful of my own experience."
>
> --a psychologist from the normative group

> "As a human being, Professor---- is a rare man. Few people have as much real concern for their fellows. As a teacher, he did many things well. However, he seemed much more able to train people than to educate them. Curiosity about underlying principles was actually discouraged--students shouldn't clutter their minds with such considerations. There was much emphasis on the 'right' answers to problems and the 'correct' method of solution. It was not possible to receive a good grade on a laboratory report if your experimental data were not very nearly the same as results obtained in previous years. Uniformity of results and conformity to accepted procedures and thought processes were positively reinforced in many ways."
>
> --a creative chemist

> "He took a 'gate-keeper' role for the profession, telling me and several other students after one year that we were 'unsuitable and unlikely' Ph.D. candidates. We had no course for appeal or review --his opinions were unarguable...I refused to accept his opinion, but it hurt then, and was a dead-end opinion with no remediation possibilities presented ...I still dislike and distrust him...I developed despite him."
>
> --a psychologist from the normative group

Inhibiting Factor #2. Teacher was insecure.

> "He was extremely egocentric and could not tolerate sharing credit. He needed constant reassurance that he was, in fact, the mentor of our group and that all good ideas ultimately came from or through him. Opposition was treated with savage sarcasm and quickly put down. He often used some members of the group as pawns in his attacks upon others. He enjoyed the company of absequious persons and would admit to having no peers. Some fared well in his laboratory and I don't know how...He was actually easy to deal with if one employed child psychology. Although I already had my Ph.D. degree, my experience in his laboratory came close to convincing me that academic life was ugly and I was considering leaving science altogether when I fortunately landed a university position and started teaching."
>
> --a creative chemist

> "I recall Dr. ---- being dogmatically critical about a couple of issues which I am now certain he was

probably underinformed about. He taught a psychotherapy course and covered behavior therapy, a topic he knew little about. Instead of abiding by his alleged intention of surveying and looking, he seemed pre-biased, and was cynically critical. He seemed very compulsive about hair splitting details, was very controlling of opinions...few who wished to avoid his cynical needles would bring up controversial ideas. A germinal idea would be sacrificed to a petty flaw. It was made clear that you must endure the 'rites of passage' and act like it was an honor. He about shot me down on...orals-over trivial points-all the time being ultra-polite, and wielding the academician's scalpel of 'prove it' and 'how is that so.'"

--a psychologist from the normative group

"Incessant criticism of me as an individual, with occasional temper tantrums thrown in for good measure, had the short range (5 yr.) effect of inhibiting my 'free-thinking." This experience was so intense that I thought at times within that period of giving up science altogether since I was simply too self-critical."

--a creative chemist

"---- is, or was, an insecure person, highly guarded in his relationships and not too bright. He never stimulated one to seek further. There always seemed to be a corrosive underpinning to him. Sarcasm--but not in jest--more in order to draw fire (away) from his quite human anxieties...He was, or is, too guarded and brought out one's own needs to cover one's ass. It's hard to contribute in such an environment."

--a psychologist from the normative group

Inhibiting Factor #3 (Creative Group). Teacher lacked enthusiasm.

"His main shortcoming was an unenthusiastic, monotonous, boring, dull, droning, sonorous, affectless, uninteresting (get the idea?) approach to everything."

--a psychologist from the normative group

"He showed no real enthusiasm either for research or for teaching. When asked to elaborate on an explanation he gave in class he announced 'that's

the only way I know how to explain it and
even if you don't understand it you had
better be able to write it down in an exam."
And the question was asked in the next exam...
He gave a classic example of what not to be."

a creative chemist

"He was generally stilted and rigid - undoubtedly
intelligent and a nice guy but not inspiring,
dynamic, or stimulating. He taught a subject,
not people."

--a psychologist from the normative group

Inhibiting Factor #3 (Normative Group). Teacher was dogmatic and rigid.

"Dr. ---- insisted that students should obtain the expected, standard results from lab experiments, and considered deviant results worthless. He would have his students repeat experiments until they obtained the expected results, and discard the deviant ones. This is a habit one must not get into in research after graduate school, and hard to avoid once one has been in Dr. ----'s courses. Secondly, he taught students to accept that results published by prominent scientists should not be questioned, and if a student can not reproduce them, the student is inevitably wrong."

--a creative chemist

"Prof. ----, who was my dissertation advisor, affected my own self-image and sense of competence in quite a negative way during the dissertation process. He was rigid and dogmatic in terms of how the dissertation should be prepared, querilous and opinionated with regard to interpretation and evaluation of the data, and deprecatory in terms of my ability to conceptualize the central problems to which the paper addressed itself. Despite this, I had come to him as one of the best students in the class, was one of his only students (because of his reputation for emitting the kinds of destructive behavior I have categorized), and did do a dissertation that was ultimately published in two places. In short, he was a negative influence on my creativity because, for several years thereafter, I was unable to develop my own ideas because I judged them in the negative terms in which he had judged them."

--a psychologist from the normative group

> "Dr. ---- considered himself a god, in the negative sense. He tolerated no deviation whatever from what he taught, the way he taught it. Students were encouraged thereby to become mere parrots. When I worked out different proofs for the equations covered in his course, he marked them wrong even though they were right, and he failed me for my daring to be different."
>
> --a creative chemist

The remaining inhibiting factors are of lesser importance and relatively self-explanatory, so no further details will be given here.

The word pictures of the facilitating and inhibiting teachers given above should not be construed as indicating that all facilitating teachers were completely grand and glorious, and all inhibiting teachers were completely bad. Many of the same negative traits of the inhibiting teachers were also reported for the facilitating teachers. The difference seemed to be, however, that the negative traits were only minor parts of the overall personalities of the facilitating teachers, and were quite outshone by their positive attributes. In the inhibiting teachers, however, these negative traits became grand passions.

Overall, the college classroom seems to be a place in which creativity can be inhibited and stifled. For creativity to be truly nourished, however, the faculty member apparently must assume a much broader role outside of the classroom. He must gain the respect of the student and present to the student an acceptable life-style model. As an authority figure he must reward independence and creativity, and provide the freedom and security in which the young scientist may, cautiously at first, try out his own, original ideas.

Personality Differences

Table 28 presents those personality factors which significantly differentiated between facilitating and inhibiting teachers, and which were based on groups having N's of 20 or more. Generally speaking, some support was provided for the picture of the facilitating teachers as persons who are more introverted and more esthetically sensitive than inhibiting teachers, with inhibiting teachers being more persevering. A number of other comparisons yielded significant differences between facilitating and inhibiting teachers on all factors except Factor C (Ego strength). These comparison, unfortunately, were based on sample sizes of less than 20 for the inhibiting groups.

Vocational/Personal Data

Table 29 presents those vocational/personal items which significantly differentiated facilitating from inhibiting teachers and which were based on groups having N's of 20 or more. These items indicate that facilitating teachers, as contrasted to inhibiting teachers, more often spend 50 or more hours per week in connection with their work, and obtain more

Table 28. Comparison of Facilitating Teachers with Inhibiting Teachers on Significant Personality Factors

Factor and Groups	Facilitating Teachers		Inhibiting Teachers		t test
	Mean	SD	Mean	SD	
A (Extroversion)					
Graduates, Group IV	13.23	5.99	15.97	7.93	2.05*
G (Perseverance)					
Psychologists, Groups I, II, and III	20.38	5.93	23.93	6.35	2.75**
Chemists, Group IV	25.93	5.74	28.65	4.89	2.09*
B/W (Esthetic Sensitivity)					
Psychologists, Group IV	29.40	14.65	23.85	12.41	2.18*

Notes--1. B/W=Barron-Welsh Art Scale
2. N varied from 23 to 120 for individual means.

$^{*}p < .05$
$^{**}p < .01$

Table 29. Comparison of Facilitating Teachers with Inhibiting Teachers on Significant Vocational/Personal Items

Item Number and Group	Chi Square	Item Content
4.		
All Subjects, Groups I, II, and III	15.60**	I spend the following approxi- number of hours weekly in connection with my work (including time spent both at my place of employment and elsewhere): (a) 30 or less (b) 31 to 40 (c) 40 to 50 (d) 50 to 65 (e) 65 or over
Chemists, Groups I, II, and III	12.04**	
5.		
All Subjects, Groups I, II, and III	13.66**	In relation to my work, I: (a) Am completely happy only when working (b) Get a great deal of satisfaction from it (c) Get some satisfaction from it (d) Am not too happy with my vocational choice (e) Wish I had gone into another field
Chemists, Groups I, II, and III	11.98**	
6.		
Psychologists, Group IV	7.90*	Concerning professional positions, the most important one of the following factors, in my opinion, is: (a) Opportunity for permanent work and for advancement (b) Stimulating associates and atmosphere conducive to teaching (c) Opportunity to combine teaching with research or administrative duties (d) Opportunity to do really creative research and to choose problems of interest to me
Chemists, Groups I, II, and III	7.85*	
Chemists, Group IV	8.11*	
Graduates, Group II	8.55*	

Note--N varied from 23 to 255.

*p < .05
**p < .01

satisfaction from it. Similarly, in reference to professional positions they are more concerned about the opportunity to do really creative research and to choose problems of interest to them. Inhibiting teachers, on the other hand, are more concerned over having stimulating associates, atmosphere conducive to teaching, and the possibility of combining teaching with research or administrative duties.

Thus, the personality and Vocational/Personal data reinforce the picture of the facilitating teacher generated from the Inventory of Teaching Factors--an enthusiastic, dynamic, demanding person of high standards who enjoys teaching and students and spends long hours at it, but who basically is an introverted, esthetically sensitive individual with a strong orientation to research.

Comparison of Creative Facilitating Teachers with Facilitating Teachers Nominated by Normative Groups

This comparison was designed to shed light on the question "are teachers who inspire potentially highly creative students different from those who inspire other students?" Some insight into this situation may first be gained by simply examining the number of instances in which members of the normative groups nominated the same facilitating teachers as members of the creative groups. Since these groups were matched for age, sex, education, and wherever possible, for institution in which terminal degree was received, there was considerable opportunity for these group members to have had experiences with the same teachers. However, considering the number of nominations of facilitating teachers who most significantly affected the development of these men, only 15% of the nominations represented teachers selected by both creative and normative group members.

Turning to the results of the Inventory of Teaching Factors, when comparing the most creative teachers to the normative groups, only three items proved to significantly differentiate the groups. These are reported in Table 30. Thus, the teachers who facilitated the development of the highly creative students were much more often researchers of strong national reputations who were more interested in research than teaching. They tended to be more interested in a few, select students than in students in general. The data from the write-in items (Tables 24 and 25) further support this point of view by indicating that only the teachers of the creative students were highly selective; the teachers then quite often tended to treat these select students as equals.

Table 31 presents the comparison of those significant personality traits which were based on sample sizes of 20 or more. Thus the teachers who significantly affected highly creative students appear to be both more introverted and more dominant than the teachers who influenced the students in the normative groups.

Turning to the Vocational/Personal data, only one item differentiated these groups. This item (#4) was found significant ($X^2 = 10.08$; $p < .05$) for only one comparison, chemistry creative group compared with the chemistry normative group. This finding indicated that creative facilitating chemistry teachers more often spend 50 hours or more per week in connection with their work than do their peers in the normative group.

Overall, teachers who facilitate the development of potentially highly creative students seem to be very much like those teachers who inspire other students. This seems to be especially true in regard to classroom performance. They seem to differ from normative group teachers mainly in having a stronger research orientation and being more strongly motivated to succeed in research.

Table 30. Comparison of Highly Creative Facilitating Teachers with Normative Group Facilitating Teachers on Significant Items, Inventory of Teaching Factors

Item No.	Chi Square	Item Content
16	4.01*	The teacher seemed personally interested in teaching and in his students: a. almost always b. usually c. occasionally d. seldom or never
45	24.86	Generally speaking, the teacher seemed to be: a. more interested in research than teaching b. equally interested in both teaching and research c. more interested in teaching than research
46	14.99	In regard to his research, I considered the faculty member to be: a. an outstanding national researcher b. a researcher of good local reputation c. more of a teacher than a researcher

Notes--1. Highly Creative Facilitating Teachers were members of Group I.
2. $p < .01$ except for those values starred (*), in which case $p < .05$.

Table 31. Comparison of Highly Creative Facilitating Teachers with Normative Group Facilitating Teachers on Significant Personality Factors

Factor and Group	Creative Facilitating Teachers		Others		t test
	Mean	SD	Mean	SD	
E (Dominance)					
All Subjects	31.46	6.49	28.75	7.33	2.32*
All Graduates	32.14	5.51	28.98	7.27	2.03*
A (Introversion)					
All Graduates	12.45	6.17	15.45	5.43	2.28*

Notes--1. Highly Creative Facilitating Teachers were members of Group I.
2. N varied from 29 to 120 for individual means.

*p < .05

Comparison of Psychologists with Chemists

Table 32 indicates those Inventory of Teaching Factors items which were found to significantly differentiate psychologists from chemists, As may be noted, the majority of differences appeared when comparing all facilitating psychologists with all facilitating chemists. Many of the same items continued to differentiate the creative facilitating psychologists from the same category of chemists, while a fewer number of the same items differentiated the normative group psychologists from the normative group chemists. All differences found were in the same direction.

Considering only facilitating teachers, psychology teachers, as contrasted to chemistry teachers more often conducted their classes in an informal atmosphere, lectured to their classes less often, and generally speaking conducted their classes more often in an unstructured and "free wheeling" manner with less reliance on course outlines. In the same vein, psychologists more often expressed strong views on matters in the classroom, and more often "challenged" classes with brutally strong statements in order to elicit class discussions.

Psychologists more often asked students to state preferances for materials to be covered in class. They less often read from notes or books, but they also were less likely to be well prepared for class, and less likely to convey penetrating insights into problems. They also were more likely to use language in class that the students did not understand.

The psychology teachers less often demonstrated strong enthusiasm about learning in general, and did not encourage independent study as much as the chemists.

Outside of the classroom, psychology teachers were less available to students. They also were less likely to encourage students to come to them for discussions on academic or personal matters. Finally, psychologists less often encouraged students to be independent thinkers than did the chemistry teachers.

In regard to inhibiting teachers, Table 32 indicates that all inhibiting teachers, whether in psychology or chemistry, were very much alike from the students' point of view. The main differences were that psychology teachers were more student oriented in their teaching. Thus, they lectured less often, more often encouraged participation in class discussions, and less often read from notes or books. When students disagreed with the instructor, psychology teachers more often used this as a springboard for class discussions. Psychologists also put more emphasis on class attendance than did chemists. Finally, inhibiting psychology teachers more often seemed to have a high level of commitment to their field than did inhibiting chemistry teachers.

Turning now to a comparison of psychology and chemistry teachers who facilitated the development of students with strong research potential, the creative facilitating psychology teachers differed from their chemistry counterparts in most of the same ways as the facilitating

Table 32. Comparison of Psychologists with Chemists on Significant Items, Inventory of Teaching Factors

Item No.	Comparison Number						Item Content
	1	2	3	4	5	6	
1	8.53	6.27*					Classes were generally conducted in the following type of atmosphere: a. very informal b. moderately informal c. fairly formal d. severely formal
2	103.21	49.79	51.44	4.36			The teacher lectured to the class: a. all of the time b. most of the time c. about half of the time d. a small amount of the time e. almost never
3				8.14			Student participation in class discussions: a. was strongly encouraged b. was moderately encouraged c. was discouraged
4	13.84	5.00*	9.11				Students were asked to state their preferences as to topics to be covered in class: a. almost always b. usually c. occasionally d. seldom or never
6	41.81	22.01	18.64				The teacher relied on materials from the assigned texts for his lectures: a. almost always b. usually c. occasionally d. seldom or never
7	6.01*		4.35*	4.33*		3.88*	The faculty member read his lectures directly from notes or from books: a. almost always b. usually c. occasionally d. seldom or never

Notes--1. Comparisons included the following groups: No. 1--All Facilitating Groups; No. 2--All Facilitating Creative Groups (I, II, and III); No. 3--All Facilitating Normative Groups; No. 4--All Inhibiting Groups; No. 5--All Inhibiting Creative Groups (I, II, and III); and No. 6--All Inhibiting Normative Groups.

2. All item responses were tested for significance using chi square.

3. $p < .01$ except those values starred (*), in which case $p < .05$.

Table 32. Comparison of Psychologists with Chemists on Significant Items, Inventory of Teaching Factors (cont'd)

Item No.	Comparison Number						Item Content
	1	2	3	4	5	6	
8	5.76*	4.72*					The instructor was well prepared for class: a. almost always b. usually c. occasionally d. seldom or never
10	4.38*						The faculty member used language in the classroom that the students understood: a. almost always b. usually c. occasionally d. seldom or never
13				7.07		4.38*	The teacher seemed to have: a. a high level of commitment to his field b. a moderate level of commitment to his field c. a low level of commitment to his field
15				4.00*	5.23*		When students disagreed with the instructor he reacted in a positive way, using such disagreements as a springboard for class discussions, debates, etc.: a. almost always b. usually c. occasionally d. seldom or never
16		3.93*					The teacher seemed personally interested in teaching and in his students: a. almost always b. usually c. occasionally d. seldom or never

Notes--1. Comparisons included the following groups: No. 1--All Facilitating Groups; No. 2--All Facilitating Creative Groups (I, II, and III); No. 3--All Facilitating Normative Groups; No. 4--All Inhibiting Groups; No. 5--All Inhibiting Creative Groups (I, II, and III); and No. 6--All Inhibiting Normative Groups.

2. All item responses were tested for significance using chi square.

3. $p < .01$ except those values starred (*), in which case $p < .05$.

Table 32. Comparison of Psychologists with Chemists on Significant Items, Inventory of Teaching Factors (cont'd)

Item No.	Comparison Number						Item Content
	1	2	3	4	5	6	
20	33.53	10.41	24.34				Classes were: a. highly structured b. moderately structured c. rather unstructured and "free wheeling"
22				5.32*			Attendance in class as far as the instructor was concerned: a. was relatively unimportant b. was moderately important c. was very important
28	16.84	7.17	9.84				In the classroom, the instructor conveyed brilliant and penetrating insights into problems: a. almost always b. usually c. occasionally d. seldom or never
29	7.42	7.64					In the classroom, the teacher demonstrated a high level of enthusiasm about learning in general: a. almost always b. usually c. occasionally d. seldom or never
30	4.13*						The instructor encouraged independent study on the part of students: a. almost always b. usually c. occasionally d. seldom or never

Notes--1. Comparisons included the following groups: No. 1--All Facilitating Groups; No. 2--All Facilitating Creative Groups (I. II, and III); No. 3--All Facilitating Normative Groups; No. 4--All Inhibiting Groups; No. 5--All Inhibiting Creative Groups (I. II, and III); and No. 6--All Inhibiting Normative Groups.

2. All item responses were tested for significance using chi square.

3. $p < .01$ except those values starred (*), in which case $p < .05$.

Table 32. Comparison of Psychologists with Chemists on Significant Items, Inventory of Teaching Factors (cont'd)

Item No.	Comparison Number						Item Content
	1	2	3	4	5	6	
31	9.35	7.68					The teacher followed a course outline or study plan: a. almost always b. usually c. occasionally d. seldom or never
34	8.21		4.53*			3.81*	In the classroom, the instructor expressed strong views on matters: a. almost always b. usually c. occasionally d. seldom or never
35	10.89	4.32	5.96*				The teacher "challenged" the class with brutally strong statements in order to elicit class discussions: a. almost always b. usually c. occasionally d. seldom or never
38	9.06	8.21					The instructor encouraged students to come to him to discuss class-related matters: a. almost always b. usually c. occasionally d. seldom or never
39	10.48	13.90					The teacher encouraged students to come to him for help on personal matters: a. almost always b. usually c. occasionally d. seldom or never

Notes--1. Comparisons included the following groups: No. 1--All Facilitating Groups; No. 2--All Facilitating Creative Groups (I, II, and III); No. 3--All Facilitating Normative Groups; No. 4--All Inhibiting Groups; No. 5--All Inhibiting Creative Groups (I, II, and III); and No. 6--All Inhibiting Normative Groups.

2. All item responses were tested for significance using chi square.

3. $p < .01$ except those values starred (*), in which case $p < .05$.

Table 32. Comparison of Psychologists with Chemists on Significant Items, Inventory of Teaching Factors (cont'd)

Item No.	Comparison Number						Item Content
	1	2	3	4	5	6	
40	6.41	5.86*					The faculty member was available to students outside of the classroom: a. almost always b. usually c. occasionally d. seldom or never
43	7.11	5.45*					The teacher encouraged students to be independent thinkers: a. almost always b. usually c. occasionally d. seldom or never

Notes--1. Comparisons included the following groups: No. 1--All Facilitating Groups; No. 2--All Facilitating Creative Groups (I, II, and III); No. 3--All Facilitating Normative Groups; No. 4--All Inhibiting Groups; No. 5--All Inhibiting Creative Groups (I, II, and III); and No. 6--All Inhibiting Normative Groups.

2. All item responses were tested for significance using chi square.

3. $p < .01$ except those values starred (*), in which case $p < .05$.

teachers overall. Additionally, however, they seemed less interested in teaching and in their students.

The teachers who inhibited the development of highly creative students were almost identical in both psychology and chemistry. Psychology teachers did differ on one item, in that when students disagreed with them, they more often were likely to use this as a springboard for class discussion.

The facilitating psychology teachers comprising the normative group differed on only a few items from their chemistry counterparts. Specifically, psychologists tended to be more student oriented in the classroom, lecturing less often, more often asking students to state their preferences for topics to be covered, etc. In general, they were more "free wheeling" in their conduct of classes than the chemists, more often expressing strong views and challenging students with strong statements to elicit class discussions.

Finally, teachers who inhibited the development of members of the normative group were found to differ only on three items. Thus, psychology teachers were again found to read from notes or books in the classroom less often than chemists, and were more likely to express strong views in the normal course of teaching. Psychologists also were more often found to have a high level of commitment to their field.

Reference to Tables 24-27 indicates that although there were differences in priorities of factors vitally affecting the student/teacher relationships in psychology and chemistry, the same overall set of factors emerged from the two groups. The only significant difference appeared to be the chemists heavy concern over inhibiting teachers emphasis on rote learning. This concern was not evidenced by the psychologists.

Turning now to personality traits of the two groups, Table 33 presents the results of the analyses of personality factors which yielded significant results based on individual sample sizes of 20 or more. Items comprising these personality factors may be found in Tables 18, 19, 20, and 34, and in Appendix C.

As may be noted, psychology teachers in general appeared to be more dominant than chemistry teachers. They exhibit a greater preferance for complexity, and are more esthetically sensitive. Chemistry teachers, however, seem to be more persevering and to have greater initiative.

Table 35 indicates only one significant difference between psychologists and chemists on Vocational/Personal items. Thus psychology teachers appear to be more concerned professionally with the opportunity to do really creative work and to choose problems of interest to them, while chemistry teachers tend to more often be concerned with stimulating associates, atmosphere conducive to teaching, and opportunity to combine teaching with research or administrative duties.

Psychologists thus emerge, both in and out of the classroom, as

Table 33. Comparison of Psychologists with Chemists on Significant Personality Factors

Factor and Groups	Psychologists		Chemists		t test
	Mean	SD	Mean	SD	
A (Extroversion)					
All Facilitating Teachers	14.96	6.25	12.71	5.68	3.29**
Creative Facilitating Teachers (I, II, and III)	14.25	6.26	12.41	5.46	2.12*
Normative Facilitating Teachers (IV)	15.92	6.10	13.24	6.01	2.40*
E (Dominance)					
All Facilitating Teachers	31.39	6.80	28.06	7.11	4.15**
All Inhibiting Teachers	32.17	6.10	29.05	6.73	2.40*
Creative Facilitating Teachers (I, II, and III)	31.62	6.35	29.07	7.28	2.50*
Normative Facilitating Teachers (IV)	31.06	7.36	26.28	6.44	3.75**
Graduate Facilitating Teachers	31.77	7.03	27.93	6.41	3.49**
Graduate Creative Facilitating Teachers (I, II, & III)	32.47	6.23	28.65	6.75	2.84**
Graduate Normative Facilitating Teachers (IV)	30.82	7.89	26.35	5.25	2.33*
G (Perseverance)					
All Facilitating Teachers	20.79	5.69	26.49	5.42	8.91**
All Inhibiting Teachers	23.29	5.76	26.51	6.51	2.60*
Creative Facilitating Teachers (I, II, and III)	20.48	5.93	26.20	5.56	6.72**
Normative Facilitating Teachers (IV)	21.21	5.34	26.98	5.11	5.99**
Graduate Facilitating Teachers	21.04	5.34	26.45	5.62	6.04**
Graduate Creative Facilitating Teachers (I, II, & III)	21.31	5.59	26.33	6.03	4.17**
Graduate Normative Facilitating Teachers (IV)	20.67	4.96	26.70	4.57	4.53**
SDI (Initiative)					
All Facilitating Teachers	30.33	7.14	32.19	7.34	2.16*
Creative Facilitating Teachers (I, II, and III)	29.61	7.40	32.77	7.32	2.77**

Notes--1. SDI=Self-Description Inventory
2. B/W=Barron-Welsh Art Scale
3. N varied from 20 to 160 for individual means.

*p < .05
**p < .01

Table 33. Comparison of Psychologists with Chemists on Significant Personality Factors (cont'd)

Factor and Groups	Psychologists		Chemists		t test
	Mean	SD	Mean	SD	
B/W (Esthetic Sensitivity)					
All Facilitating Teachers	30.39	14.36	17.98	10.36	8.61**
All Inhibiting Teachers	24.83	12.50	16.84	11.48	3.16**
Creative Facilitating Teachers (I, II, and III)	31.48	13.52	19.03	10.72	6.85**
Normative Facilitating Teachers (IV)	28.95	15.28	16.07	9.40	5.42**
Graduate Facilitating Teachers	32.45	14.74	18.81	10.27	6.47**
Graduate Creative Facilitating Teachers (I, II, & III)	33.16	13.59	20.10	10.78	5.11**
Graduate Normative Facilitating Teachers (IV)	31.50	16.11	16.00	8.41	4.14**

Notes--1. SDI=Self-Description Inventory
2. B/W=Barron-Welsh Art Scale
3. N varied from 20 to 160 for individual means.
*p < .05
**p < .01

Table 34. Items Comprising Significant Personality Test

Inventory	Item Number	Item Content	
Self-Description Inventory, Initiative Scale	3	a. Cooperative	b. Inventive
	9	a. Industrious	b. Practical
	11	a. Unaffected	b. Alert
	12	a. Sharp-witted	b. Deliberate
	17	a. Affectionate	b. Frank
	19	a. Sincere	b. Calm
	21	a. Poised	b. Ingenious
	25	a. Responsible	b. Reliable
	32	a. Honest	b. Generous
	33	a. Shy	b. Lazy
	35	a. Noisy	b. Arrogant
	47	a. Changeable	b. Prudish
	53	a. Weak	b. Selfish
	57	a. Opinionated	b. Pessimistic
	59	a. Hard-hearted	b. Self-pitying
	60	a. Cynical	b. Aggressive
	61	a. Dissatisfied	b. Outspoken

Table 35. Comparison of Psychologists with Chemists on Significant Vocational/Personal Item

Item Number and Group	Chi Square	Item Content
6.		
All Facilitating Teachers	8.45*	Concerning professional positions, the most important one of the following factors, in my opinion, is: (a) Opportunity for permanent work and for advancement (b) Stimulating associates and atmosphere conducive to teaching (c) Opportunity to combine teaching with research or administrative duties (d) Opportunity to do really creative research and to choose problems of interest to me
All Inhibiting Teachers	13.17**	

Note--N varied from 38 to 153.

*$p < .05$
**$p < .01$

individuals who are more relaxed with people than are chemists, and who take a less formal stance on most matters. In interpersonal relationships they are more dominant, and tend to be more unconventional. From the personality point of view, psychologists seem to be the half-way point between the hard sciences and the arts.

DISCUSSION

This research project was originally designed to be a study of the effect of undergraduate and graduate college teachers on those select students who ultimately complete the Ph.D. degree and contribute as professional persons to the culture. However, the Ph.D. scientists responsible for nominating the teachers who had most affected their development, uniformly selected those faculty with whom their major contacts had been in graduate school. The resulting descriptions of classes and student/teacher relationships reflected this graduate orientation, and the results of the study should therefore be considered as primarily relating to graduate training in the sciences.

The data obtained from the Inventory of Teaching Factors depicted a rather clear picture of facilitating and inhibiting teachers which did not vary significantly upon further analyses. The same cannot be said, however, for the personality data, largely because, as was indicated in the section comparing psychologists with chemists, psychologists are considerably different persons personality-wise than are chemists, even though the two groups apparently differ very little in regard to the ways in which they facilitate or inhibit creativity in the students they teach. The personality differences between the facilitating and inhibiting teachers within each field then became difficult to measure, primarily because of the small number of nominations of inhibiting teachers. Scientists were very reluctant to nominate teachers who had had inhibiting effects on their lives. A number of scientists who nominated inhibiting teachers wrote (at the time they completed the Inventory of Teaching Factors) voicing grave concern as to anonymity of nomination and nominator, both for the sake of the nominated teachers, and for their own. Considering the depth of relationship which many, if not most, Ph.D. students experience with their major professors or other graduate faculty members, it is perhaps a tribute both to the study and to the courage of the scientists that any negative teacher nominations were received. Nevertheless, the small number of these nominations resulted in the inability to adequately test some of the personality measures.

Creativity in Teaching vs. Creativity in Research

Creativity in teaching apparently requires many of the same traits as creativity in research. Certainly some support has been provided for the traits of introversion, dominance, and self-sufficiency as necessary for both creative teaching and creative research. This becomes even more meaningful, when Table 14 is reviewed, which indicated no real differences in research productivity between facilitating or inhibiting psychology teachers, or between creative facilitative teachers and facilitative teachers in the normative psychology group. Thus, the differences, at least in regard to psychologists, cannot be attributed to differences in research productivity of the groups.

The lack of support for the trait of initiative, as necessary for high-level creativity in teaching, and for ego strength as necessary for creativity in teaching at any level, has been accepted by this investigator as simply indicating that these personality attributes are of lesser importance to creativity in teaching than to creativity in research. An analysis of the prime requisites for success in each of these areas as defined in this study and in Chambers' (1964) study of creative research psychologists and chemists, indicates that while researchers must initiate or develop new products, ideas, etc. to be creative, the teacher may achieve creative status by having an appreciation and consideration for creativity in others, and by helping them to be creative through encouragement and the like, even though the teacher himself may not be a creative researcher. Similarly, the creative researcher is in the forefront of new ideas and applications and must bear the brunt of "being in the front lines" when change occurs as a result of his creation. The teacher, however, although providing support for the potentially creative researcher, may or may not have to bear the full brunt of hardships resulting from individuals' reactions to change arising as as result of the creative research of the students the teacher has helped. Thus, strong initiative and a strong ego, although apparently necessary for creativity in research, do not seem to be as necessary for creativity in teaching.

A factor which gave conflicting results was esthetic sensitivity. Although creativity in teaching in psychology was found associated with high esthetic sensitivity, and psychologists were found to be much more esthetically sensitive than chemists, no differences were found within the field of chemistry. This seems to be due to a great extent to the characteristics of the fields themselves. Thus psychologists, studying behavior, apparently become concerned with the nuances of human behavior, which affords them greater insights into their students and their research problems. Such sensitivities seem to be comparable to the form, color, and other sensitivities of the artist, and indeed, creative psychologists fall very close to architects and artists on the Barron-Welsh Art Scale, while chemists are much closer to the average man. Thus, it appears that esthetic sensitivity is necessary for creativity in teaching in certain fields only; it appears to become more necessary in moving from the natural sciences through the social sciences and on to the arts and humanities.

The trait of perseverance, as measured by the 16 Personality Factor Questionnaire, Factor C, was probably the most difficult factor to analyze and interpret in this study, since significant differences were found in the opposite direction from the predicted one. Thus facilitating teachers were found to be less persevering than inhibiting teachers, and psychologists were found to be less persevering than chemists. An intensive examination of the items comprising this factor, however, has led the investigator to attribute these differences between the groups in relation to perseverance as interpreted as persistent following of social mores, rather than as persistance in attacking intellectual problems until solutions are found. This interpretation is consistent with the general findings in this and other studies of psychologists and chemists (Chambers, 1964), as psychologists have normally been found to be more bohemian and less conventional in their social behavior than chemists. Similarly, creative researchers have usually been found to be less concerned with adherance to social standards than their less creative peers; therefore it is logical to assume that teachers who facilitate creative behavior in students would also be likely to be less concerned with social standards than would those teachers who inhibit creativity. Tables 24-27, indicating the significant factors in student/teacher relationships which facilitate or inhibit creativity, also support this general interpretation of Factor G. Assuming this interpretation to be correct, however, this leaves completely open the question of whether perseverance in attacking intellectual problems is a necessary personality trait for high-level creativity in teaching.

A factor of final concern here--striving for excellence--was not directly measured by any of the personality tests employed. However, the results of the write-in items reported in Tables 24-27 indicated quite clearly that striving for excellence is a strong component of facilitating teachers. It appears to be an important factor in facilitating the creative development of students regardless of their potential for later creative contribution to their field.

Successful College Teachers

Successful college teachers, by definition the teachers who facilitated the creative development of their students, were clearly differentiated in this study from their unsuccessful peers, in regard to behavior characteristics both in and out of the classroom. Many of these characteristics matched those previously found in studies of subcollegiate teachers (Ryans, 1960), and undergraduate teachers (Ronan, 1971). Surprisingly, and unfortunately, direct and open reinforcement of creative behavior exhibited by students, was not a routine behavior pattern of any of the groups of teachers studied.

An important factor brought to light in this study relates to graduate vs. undergraduate teachers. Apparently the teachers who most affect the creative development of students who ultimately receive the Ph.D., do so in the course of graduate programs, not during undergraduate days. In addition, the significant effect upon the student appears not to be as a result of classroom experiences, but rather results from experiences in the laboratory, the office, the home, or other informal settings.

The interactions that result in significant change for the student, are usually a number of one-to-one experiences with the teacher over considerable periods of time, during which strong emotional ties are formed, and mutual respect is developed.

College teaching, and especially teaching at the graduate level as noted above, thus encompasses far more than classroom performance in the overall development of the student as a creative professional person. In this regard the current emphases of many legislative groups throughout the United States on the necessity of college faculty members being in the classroom 12 hours each week, is at best misguided. The important outcome of graduate education is the quality of contribution which is later made by graduate students once they have received their degrees. Emphasis of legislators, presidents or deans on faculty time spent in the classroom, rather than an emphasis on evaluation of the end result of the educational process (the contributions of the educated persons to society) can only lead to greater mediocrity in the quality of education than now exists, and to fewer significant contributions of professional people to their culture.

Several other factors bear on the question of successful college teaching. As the situation in this country now stands, the greatest support for scientific research in which the researcher chooses his own problem, exists within universities, and is coupled with teaching at the graduate level. A relevant question is--is this the best way to achieve excellence in graduate training for potential Ph.D.'s--and alternatively, is this the best way to achieve the highest levels of creative research from the faculty concerned? An earlier study of eminent research scientists (Chambers, 1964), indicated that many of the more creative researchers believed that 40 hours or more per week should be spent in active research if creative output is to be maximized. Further, in seeking positions, the more creative men were concerned predominately with opportunities to do really creative research and to choose problems of interest to them, while the less creative scientists were more concerned with opportunities to combine teaching and administrative duties with research. In the current study, the teachers who most affected those students who later produced the most highly creative research, were categorized as being more interested in research than teaching. In addition, a number of the creative teachers were described very apologetically by the students, as "quite bad" in the classroom, but great outside of it.

Taking all of the above factors into consideration, it would seem worthwhile for American universities to experiment with an altered form of graduate training, in which research institutes, while still a part of the university, would be separate from academic departments and would be staffed by full-time research faculty members in positions funded by the universities. A required part of the training of every undergraduate and graduate science student would be to serve in an apprentice-type situation on various research projects starting in the junior year or before. Academic credit would be given for such training. At the time the graduate student was ready to select his dissertation topic and director, he could then choose either a member of the research institute or a member of his academic department.

Although the concept of research institutes is by no means a new idea in education, the funding of such institutes has largely been left to the Federal Government, and has occurred as a result of the grantsmanship abilities of given faculty members. Even with this unsubstantial economic foundation, those institutes which have existed at the major United States universities have amply demonstrated their value both in production of creative research and in quality of Ph.D. students emerging from the universities. It now seems time, however, for universities of varying sizes and levels of intellectual sophistication to try the institute approach on a much broader, more economically stable basis, and with more explicit guidance as to the role of the research institute, in the academic preparation of both undergraduate and graduate science students.

SUMMARY AND RECOMMENDATIONS

This nationwide study has attempted to inquire into the relation of personality traits, classroom behavior, and student/teacher relationships to creativity in teaching at the college level. Creative teachers were identified through an evaluation (by distinguished research scientists) of the research of those Ph.D. students who had studied under the teachers, and who nominated them as having had the most facilitating effect on their creative development, or as having had a significant inhibiting effect.

Normative groups of scientists, matched on the bases of sex, age, education and discipline also nominated teachers who had significantly affected their development. The classroom behavior and significant student/teachers relationship for a total of 671 such teachers were described by nominating students. A total of 492 of these teachers then completed Factors A, C, E, G, and Q_2 of the 16 Personality Factor Questionnaire, the Ghiselli Self-Description Inventory, the Barron-Welsh Art Scale, and several biographical items.

Results of the study showed the traits of introversion, dominance, and self-sufficiency to be associated with creativity. Support was also provided for an association of greater esthetic sensitivity and less adherance to social mores with creativity in teaching in the field of psychology.

Clear-cut behavioral patterns both within and outside of the classroom were found which differentiated those teachers who facilitated the creative development of students from those who hindered its development. Encouragement was found to be the most important aspect of student/teacher relationships affecting creativity. The classroom was found to be of lesser importance than outside class relationships between students and teachers, especially at the graduate level.

Based on the results of this study, when viewed in the light of previous research in the area and the existing practices in higher education, the following recommendations are advanced:

1. CREATIVITY SHOULD BE DIRECTLY AND OPENLY REWARDED WHENEVER AND WHEREVER IT OCCURS. IT IS NOT ENOUGH JUST TO GIVE A STUDENT FREEDOM AND A LABORATORY.

2. Since evidence is now available concerning the traits of creative teachers, and of creative and not-so-creative, researchers, universities should use these data in order to select entering doctoral students who show promise for success in one or the other of the two areas. Measures of intellectual ability alone will not do the entire job.

3. Colleges and universities should establish meaningful criteria for periodic evaluation leading to personnel action regarding their

teaching faculties. Such evaluations should be made of relevant professional behaviors, as identified in this and other nationwide, controlled studies.

4. Universities should develop experimental research institutes, separate from academic departments, but funded by the universities. Within these institutes, undergraduate and graduate students would earn college credit by serving as apprentices to full-time research faculty on research projects. Such faculty would serve as dissertation advisors at the request of graduate students.

5. Universities should take more cognizance of the plaintive cry of the graduate student for greater instruction in how to succeed in teaching and research. The attributes of these professions are now becoming more well-known and graduate seminars should be developed to provide assistance in these matters.

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APPENDIX A

Inventory of Teaching Factors

RESEARCH ON CREATIVITY

Jack A. Chambers
Principal Investigator

Inventory of Teaching Factors

Name of TEACHER being described ______________________

Address of TEACHER, if known ______________________

Main contact with TEACHER ______________________
(graduate or undergraduate school)

Please complete the items below as they pertained to your interactions with the TEACHER named above at the time you were in undergraduate or graduate school. Select only one response for each multiple-choice item, and indicate your response by marking an X through the letter on the right hand side of the questionnaire which corresponds to the response option you have chosen. Mark only one response per item. Use the space provided on the form for completing the open-ended questions, write on the back of the sheets or attach additional sheets if necessary. If you are unable to recall even vaguely any information or opinions asked for in any of the items, leave such items blank.

A. Classroom Activities

1. Classes were generally conducted in the following type of atmosphere:
   a. very informal b. moderately informal
   c. fairly formal d. severely formal — a b c d

2. The teacher lectured to the class:
   a. all of the time b. most of the time
   c. about half of the time d. a small amount of the time e. almost never — a b c d e

3. Student participation in class discussions:
   a. was strongly encouraged b. was moderately encouraged c. was discouraged — a b c

4. Students were asked to state their preferences as to topics to be covered in class:
   a. almost always b. usually
   c. occasionally d. seldom or never — a b c d

5. Students were asked to criticize the instructor's teaching:
a. on a class-to-class basis
b. on a periodic basis
c. seldom or never a b c

6. The teacher relied on materials from the assigned texts for his lectures:
a. almost always b. usually
c. occasionally d. seldom or never a b c d

7. The faculty member read his lectures directly from notes or from books:
a. almost always b. usually
c. occasionally d. seldom or never a b c d

8. The instructor was well prepared for class:
a. almost always b. usually
c. occasionally d. seldom or never a b c d

9. The teacher tended to lecture over the students' heads:
a. almost always b. usually
c. occasionally d. seldom or never a b c d

10. The faculty member used language in the classroom that the students understood:
a. almost always b. usually
c. occasionally d. seldom or never a b c d

11. When the teacher did not know the answer to a question:
a. he had great difficulty in admitting it
b. he had some difficulty in admitting it
c. he had little or no difficulty in admitting it a b c

12. I regarded the faculty member as:
a. an outstanding national scholar in his field b. an authority in his field locally c. teacher of average academic preparation in his field d. a person lacking adequate knowledge of his field a b c d

13. The teacher seemed to have:
a. a high level of commitment to his field
b. a moderate level of commitment to his field c. a low level of commitment to his field a b c

14. When students disagreed with the teacher, he reacted in a negative way indicating his intolerance of disagreement:
a. almost always b. usually
c. occasionally d. seldom or never a b c d

15. When students disagreed with the instructor
he reacted in a positive way, using such
disagreements as a springboard for class
discussions, debates, etc.:
a. almost always b. usually
c. occasionally d. seldom or never a b c d

16. The teacher seemed personally interested
in teaching and in his students:
a. almost always b. usually
c. occasionally d. seldom or never a b c d

17. To what extent was class emphasis placed
on memorization of materials:
a. large extent b. moderate extent
c. small extent a b c

18. To what extent was class emphasis placed
on helping students to understand
principles:
a. large extent b. moderate extent
c. small extent a b c

19. To what extent was class emphasis placed
on stimulating students to want to learn
more on their own:
a. large extent b. moderate extent
c. small extent a b c

20. Classes were:
a. highly structured b. moderately
structured c. rather unstructured
and "free wheeling" a b c

21. Examinations were used:
a. mainly as aids to learning b. mainly
as evaluation tools c. a combination of
a and b d. mainly as tools to control
the students e. none of the above a b c d e

22. Attendance in class as far as the instructor
was concerned:
a. was relatively unimportant b. was
moderately important c. was very important a b c

23. Initiative on the part of students:
a. was strongly rewarded b. was moderately
rewarded c. was somewhat discouraged
d. was strongly discouraged a b c d

24. Students giving good answers to questions in
the classroom were complimented:
a. almost always b. usually
c. occasionally d. seldom or never a b c d

25. Originality and creativity on the part of
students:
a. was strongly rewarded b. was moderately
rewarded c. was somewhat discouraged
d. was strongly discouraged a b c d

26. In the classroom, the teacher demonstrated
originality and creativity:
a. almost always b. usually
c. occasionally d. seldom or never a b c d

27. In the classroom, the teacher demonstrated
a high level of enthusiasm about course
material:
a. almost always b. usually
c. occasionally d. seldom or never a b c d

28. In the classroom, the instructor conveyed
brilliant and penetrating insights into
problems:
a. almost always b. usually
c. occasionally d. seldom or never a b c d

29. In the classroom, the teacher demonstrated
a high level of enthusiasm about learning
in general:
a. almost always b. usually
c. occasionally d. seldom or never a b c d

30. The instructor encouraged independent
study on the part of students:
a. almost always b. usually
c. occasionally d. seldom or never a b c d

31. The teacher followed a course outline
or study plan:
a. almost always b. usually
c. occasionally d. seldom or never a b c d

32. The faculty member was:
a. very intellectually demanding of his
students b. moderately intellectually
demanding of his students c. required
very little intellectual activity of his
students a b c

33. The image the teacher presented was of a:
a. hard-driving, dynamic person
b. moderately ambitious person
c. rather lazy person a b c

34. In the classroom, the instructor expressed
strong views on matters:
a. almost always b. usually
c. occasionally d. seldom or never a b c d

35. The teacher "challenged" the class with brutally strong statements in order to elicit class discussions:
a. almost always b. usually
c. occasionally d. seldom or never a b c d

36. In dealing with students in the classroom, the teacher relied heavily on cynicism and sarcasm or in other ways attempted to embarrass students:
a. almost always b. usually
c. occasionally d. seldom or never a b c d

37. Different or unorthodox views were welcome to be aired in his classroom:
a. almost always b. usually
c. occasionally d. seldom or never a b c d

B. Outside of the Classroom

38. The instructor encouraged students to come to him to discuss class-related matters:
a. almost always b. usually
c. occasionally d. seldom or never a b c d

39. The teacher encouraged students to come to him for help on personal matters:
a. almost always b. usually
c. occasionally d. seldom or never a b c d

40. The faculty member was available to students outside of the classroom:
a. almost always b. usually
c. occasionally d. seldom or never a b c d

41. Outside of the classroom, the teacher spent the following amounts of time in discussions with students about intellectual matters:
a. a great deal of time b. a moderate amount of time c. very little or no time a b c

42. The instructor seemed to be:
a. personally interested in each student
b. personally interested in some students
c. relatively uninterested in most or all students a b c

43. The teacher encouraged students to be independent thinkers:
a. almost always b. usually
c. occasionally d. seldom or never a b c d

44. The teacher encouraged a dependent relationship on the part of his students:
a. almost always b. usually
c. occasionally d. seldom or never a b c d

45. Generally speaking, the teacher seemed to be:
a. more interested in research than teaching
b. equally interested in both teaching and research c. more interested in teaching than research a b c

46. In regard to his research, I considered the faculty member to be:
a. an outstanding national researcher
b. a researcher of good local reputation
c. more of a teacher than a researcher a b c

47. The teacher in his daily life showed the following amount of enthusiasm for learning and intellectual matters:
a. a great amount b. a moderate amount
c. little or none a b c

C. Relationships between Teacher and Nominator

48. Please indicate any significant specific instances you may recall in which the teacher contributed in a positive way to your development as a creative person.

49. Cite any significant specific incidents you may recall in which the teacher contributed in a negative way to your development as a creative person.

50. The objectives of this study are to determine why and in what ways certain teachers significantly affected your development as a creative individual. Since it is possible that the above items may have missed some essential matters, please use the space below to describe those things that you feel were important in the relationship between you and the teacher you are describing, which significantly affected your development as a creative person.

(Signature)

(Name-please print)

(Title)

(Univ. or other affiliation)

(Date)

WHEN COMPLETED, RETURN THIS FORM TO:
Dr. Jack A. Chambers, Research Professor
Computer Research Center - SCA 248
University of South Florida
Tampa, Florida 33620

APPENDIX B

Factor Questionnaire
Self-Description Inventory
Vocational/Personal Data

RESEARCH ON CREATIVITY

Jack A. Chambers
Principal Investigator

Factor Questionnaire

On the following pages you will find a number of statements. Please read each one carefully, and then choose that response, from the three available, that most closely fits your individual case. Indicate your choice by MARKING AN X on the answer sheet in the box pertaining to your preferred response. PLEASE MARK ONLY ONE RESPONSE PER ITEM.

1. I would rather have a house:
   a. in a sociable suburb,
   b. in between,
   c. alone in the deep woods.

2. I can find enough energy to face my difficulties.
   a. always, b. generally, c. seldom.

3. I feel a bit nervous of wild animals even when they are in strong cages.
   a. yes(true), b. uncertain,
   c. no(false).

4. I hold back from criticizing people and their ideas.
   a. yes, b. sometimes, c. no.

5. I make smart, sarcastic remarks to people if I think they deserve it.
   a. generally, b. sometimes, c. never.

6. If I saw two neighbors' children fighting, I would:
   a. leave them to settle it,
   b. uncertain,
   c. reason with them.

7. Most people would be happier if they lived more with their fellows and did the same things as others.
   a. yes, b. in between, c. no.

8. With the same hours and pay, it would be more interesting to be:
   a. a carpenter or cook,
   b. uncertain,
   c. a waiter in a good restaurant.

9. I have been elected to:
   a. only a few offices,
   b. several,
   c. many offices.

10. I sometimes can't get to sleep because an idea keeps running through my mind.
    a. true, b. uncertain, c. false.

11. In my personal life I reach the goals I set, almost all the time.
    a. true, b. uncertain, c. false.

12. An out-dated law should be changed:
    a. only after considerable discussion,
    b. in between,
    c. promptly.

13. I am uncomfortable when I work on a project requiring quick action affecting others.
    a. true, b. in between, c. false.

14. When I see "sloppy," untidy people, I:
    a. just accept it,
    b. in between,
    c. get disgusted and annoyed.

15. As a teenager, I joined in school sports:
    a. occasionally,
    b. fairly often,
    c. a great deal.

16. If I had to choose, I would rather be:
    a. a forester,
    b. uncertain,
    c. a high school teacher.

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17. For special holidays and birthdays, I:
a. like to give personal presents,
b. uncertain,
c. feel that buying presents is a bit of a nuisance.

18. I have been let down by my friends:
a. hardly ever,
b. occasionally,
c. quite a lot.

19. I have some characteristics in which I feel definitely superior to most people.
a. yes, b. uncertain, c. no.

20. When I get upset, I try hard to hide my feelings from others.
a. true, b. in between, c. false.

21. I think that plenty of freedom is more important than good manners and respect for the law.
a. true, b. uncertain, c. false.

22. I would prefer to have an office of my own, not sharing it with another person.
a. yes, b. uncertain, c. no.

23. I would rather enjoy life quietly in my own way than be admired for my achievements.
a. true, b. uncertain, c. false.

24. In starting a useful invention, I would prefer:
a. working on it in the laboratory,
b. uncertain,
c. selling it to people

25. Some people seem to ignore or avoid me, although I don't know why.
a. true, b. uncertain, c. false.

26. People treat me less reasonably than my good intentions deserve.
a. often, b. occasionally, c. never.

27. The use of foul language, even when it is not in a mixed group of men and women, still disgusts me.
a. yes, b. in between, c. no.

28. People sometimes call me careless, even though they think I'm a likable person.
a. yes, b. in between, c. no.

29. To keep informed, I like:
a. to discuss issues with people,
b. in between,
c. to rely on the actual news reports.

30. I like to take an active part in socia affairs, committee work, etc.
a. yes, b. in between, c. no.

31. It would be more interesting to work in a business:
a. talking to customers,
b. in between,
c. keeping office accounts and records

32. When people are unreasonable, I just:
a. keep quiet,
b. uncertain,
c. despise them.

33. If people talk loudly while I am listening to music, I:
a. can keep my mind on the music and not be bothered,
b. in between,
c. find it spoils my enjoyment and annoys me.

34. I think I am better described as:
a. polite and quiet,
b. in between,
c. forceful.

35. In thinking of difficulties in my work I:
a. try to plan ahead, before I meet them,
b. in between,
c. assume I can handle them when they come.

36. It bothers me if people think I am being too unconventional or odd.
a. a lot, b. somewhat, c. not at all

37. In constructing something I would rather work:
a. with a committee,
b. uncertain,
c. on my own.

38. If the earnings were the same, I would rather be:
a. a lawyer,
b. uncertain,
c. a navigator or pilot.

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39. When the time comes for something I have planned and looked forward to, I occasionally do not feel up to going.
a. true, b. in between, c. false.

40. I can work carefully on most things without being bothered by people making a lot of noise around me.
a. yes, b. in between, c. no.

41. I occasionally tell strangers things that seem to me important, regardless of whether they ask about them.
a. yes, b. in between, c. no.

42. I find the sight of an untidy room very annoying.
a. yes, b. in between, c. no.

43. I like to do my planning alone, without interruptions and suggestions from others.
a. yes, b. in between, c. no.

44. It would be more interesting to be:
a. an artist,
b. uncertain,
c. a secretary running a club.

45. I have vivid dreams, disturbing my sleep.
a. often,
b. occasionally,
c. practically never.

46. If the odds are really against something's being a success, I still believe in taking the risk.
a. yes, b. in between, c. no.

47. I like it when I know so well what the group has to do that I naturally become the one in command.
a. yes, b. in between, c. no.

48. I close my mind to well-meant suggestions of others, even though I know I shouldn't.
a. occasionally, b. hardly ever,
c. never.

49. I always make it a point, in deciding anything, to refer to basic rules of right and wrong.
a. yes, b. in between, c. no.

50. I learn better by:
a. reading a well-written book,
b. in between,
c. joining a group discussion.

51. If asked to work with a charity drive, I would
a. accept,
b. uncertain,
c. politely say I'm too busy.

52. If I make an awkward social mistake, I can soon forget it.
a. yes, b. in between, c. no.

53. I am known as an "idea man" who almost always puts forward some ideas on a problem.
a. yes, b. in between, c. no.

54. I think I am better at showing:
a. nerve in meeting challenges,
b. uncertain,
c. tolerance of other people's wishes.

55. I am a fairly strict person, insisting on always doing things as correctly as possible.
a. true, b. in between, c. false.

56. I enjoy work that requires conscientious, exacting skills.
a. yes, b. in between, c. no.

57. For a vacation I would rather go to:
a. a busy holiday town,
b. something in between a. and c.,
c. a quiet cottage off the beaten track.

58. When I'm in a small, cramped space (as on a crowded elevator), I have an uncomfortable feeling of being "shut in."
a. never, b. rarely, c. occasionally.

59. I find myself thinking over quite trivial troubles again and again and have to make a real effort to put them out of my mind.
a. yes(true),
b. occasionally,
c. no(false).

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60. If I know that another person's line of reasoning is in error, I tend to:
a. keep quiet,
b. in between,
c. speak out.

61. My ideas appear to be:
a. ahead of the times,
b. uncertain,
c. with the times.

62. It is better to live to a ripe old age than to be worn out with good services for one's community.
a. true, b. in between, c. false.

63. I have, compared with others, participated in:
a. many community and social activities,
b. several,
c. only a few community and social activities.

64. In a factory, it would be more interesting to be in charge of:
a. mechanical matters,
b. uncertain,
c. interviewing and hiring people.

65. I would prefer to read a book on:
a. travel in outer space,
b. uncertain,
c. education within the family.

66. If I had my life to live over again, I would:
a. plan it differently,
b. uncertain,
c. want it much the same.

67. In making decisions in my life and work, I was never troubled by lack of understanding on the part of my family.
a. true, b. in between, c. false.

68. I like to avoid saying unusual things that embarrass people.
a. true, b. in between, c. false.

69. If I had a gun in my hand that I knew was loaded, I would feel nervous until I unloaded it.
a. yes, b. in between, c. no.

70. People use up too much of their leis in neighborly duties and helping wit local affairs.
a. yes, b. uncertain, c. no.

71. I find books more entertaining than companions.
a. yes, b. in between, c. no.

72. With equal salary, I would enjoy more being:
a. a research chemist,
b. uncertain,
c. a hotel manager (or manageress).

73. Going around selling things, or askin for funds to help a cause I believe i is, for me:
a. quite enjoyable,
b. in between,
c. an unpleasant job.

74. Changes in weather don't usually affect my efficiency and mood.
a. true, b. in between, c. false.

75. In a strange city, I would:
a. walk wherever I liked,
b. uncertain,
c. avoid the parts of the town said to be dangerous.

76. It is more important to:
a. get along smoothly with people,
b. in between,
c. get your own ideas put into practice.

77. When given a set of rules, I follow them when personally convenient, rather than exactly to the letter.
a. true, b. uncertain, c. false.

78. My friends probably think it is hard to get to know me really well.
a. yes, in between, c. no.

79. I solve a problem better by:
a. studying it alone,
b. in between,
c. discussing it with others.

80. When traveling, I would rather look at the scenery than talk to people.
a. true, b. uncertain, c. false.

Items reproduced courtesy of The Institute for Personality and Ability Testing.

81. I find it hard to "take 'no' for an answer," even when I know I'm asking the impossible.
a. true, b. in between, c. false.

82. I am often hurt more by the way people say things than by what they say.
a. true, b. in between, c. false.

83. It embarrasses me to have servants waiting on me.
a. yes, b. in between, c. no.

84. At work it is really more important to be popular with the right people than to do a first-rate job.
a. true, b. in between, c. false.

85. In planning social outings, I:
a. am always happy to commit myself entirely,
b. in between,
c. like to reserve the right to cancel my going.

86. Many people talk over their problems and ask advice of me when they need someone to talk to.
a. yes, b. in between, c. no.

87. I'd enjoy more being:
a. a business office manager,
b. uncertain,
c. an architect.

88. I cross the street to avoid meeting people I don't feel like seeing.
a. never, b. seldom, c. sometimes.

89. In an average day, the number of problems I meet that I can't solve on my own is:
a. hardly one,
b. in between,
c. more than half a dozen.

90. If I disagree with a superior on his views, I usually:
a. keep my opinion to myself,
b. uncertain,
c. tell him that my opinion differs.

91. I enjoy giving my best time and energy to:
a. my home and the real needs of my friends,
b. in between,
c. social activities and personal hobbies.

92. I like my acquaintances to think of me as one of the group.
a. true, b. in between, c. false.

93. When looking for a place in a strange city, I would:
a. just ask people where places are,
b. in between,
c. take a map with me.

94. It would be more interesting to be an insurance salesman than a farmer.
a. yes, b. in between, c. no.

95. Modern life has too many annoying frustrations and restrictions.
a. true, b. in between, c. false.

96. I feel ready for life and its demands.
a. always,
b. sometimes,
c. hardly ever.

97. I honestly think I am more planful, energetic, and ambitious than many perhaps equally successful people.
a. yes, b. occasionally, c. no.

98. I find it desirable to make plans to avoid waste of time between jobs.
a. yes, b. in between, c. no.

99. When I do what I want, I find I'm generally:
a. understood only by close friends,
b. in between,
c. doing what most people think is O.K.

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100. For a pleasant hobby I would rather belong to:
a. a photography club,
b. uncertain,
c. a debating society.

101. I have difficulty in following what some people are trying to say because of their odd use of common words.
a. yes, b. in between, c. no.

102. Prosecuting lawyers are mainly interested in:
a. making convictions, regardless of the person,
b. uncertain,
c. protecting the innocent.

103. People have sometimes called me a proud, "stuck-up" individual.
a. yes, b. in between, c. no.

104. When I do something, my main concern is that:
a. it is really what I want to do,
b. uncertain,
c. there will be no bad results for my associates.

105. I think most stories and movies should teach us a good moral.
a. true, b. in between, c. false.

106. I get as many ideas from reading a book myself as from discussing its topics with others.
a. yes, b. in between, c. no.

107. I would enjoy better:
a. being in charge of children's games,
b. uncertain,
c. helping a watchmaker.

108. I would prefer to lead:
a. the same kind of life I now lead,
b. uncertain,
c. a more sheltered life, with fewer difficulties to face.

109. I believe that the most important thing in life is to do what I like.
a. yes, b. uncertain, c. no.

110. My speaking voice is:
a. strong, b. in between, c. soft.

111. I greatly dislike the sight of disorder.
a. true, b. uncertain, c. false.

112. I always check very carefully the condition in which borrowed property is returned, to me or by me to others.
a. yes, b. in between, c. no.

Items reproduced courtesy of The Institute for Personality and Ability Testing.

Self-Description Inventory

The purpose of the following items is to obtain a picture of the traits you believe you possess, and to see how you describe yourself. There are no right or wrong answers so try and describe yourself as accurately and honestly as you can. Below are listed 32 pairs of traits. Choose one trait from each pair which you think is MOST descriptive of you, and INDICATE YOUR CHOICE BY MARKING AN X ON THE ANSWER SHEET in the box pertaining to your preferred response. PLEASE MARK ONLY ONE RESPONSE PER ITEM.

1. a.Capable
   b.Discreet
2. a.Understanding
   b.Thorough
3. a.Cooperative
   b.Inventive
4. a.Friendly
   b.Cheerful
5. a.Energetic
   b.Ambitious
6. a.Persevering
   b.Independent
7. a.Loyal
   b.Dependable
8. a.Determined
   b.Courageous
9. a.Industrious
   b.Practical
10. a.Planful
    b.Resourceful
11. a.Unaffected
    b.Alert
12. a.Sharp-witted
    b.Deliberate
13. a.Kind
    b.Jolly
14. a.Efficient
    b.Clear-thinking
15. a.Realistic
    b.Tactful
16. a.Enterprising
    b.Intelligent
17. a.Affectionate
    b.Frank
18. a.Progressive
    b.Thrifty
19. a.Sincere
    b.Calm
20. a.Thoughtful
    b.Fair-minded
21. a.Poised
    b.Ingenious
22. a.Sociable
    b.Steady
23. a.Appreciative
    b.Good-natured
24. a.Pleasant
    b.Modest
25. a.Responsible
    b.Reliable
26. a.Dignified
    b.Civilized
27. a.Imaginative
    b.Self-controlled
28. a.Conscientious
    b.Quick
29. a.Logical
    b.Adaptable
30. a.Sympathetic
    b.Patient
31. a.Stable
    b.Foresighted
32. a.Honest
    b.Generous

In each of the pairs of words below, MARK AN X ON THE ANSWER SHEET IN THE BOX REPRESENTING THAT WORD WHICH YOU THINK IS LEAST DESCRIPTIVE OF YOU.

33. a.Shy
    b.Lazy
34. a.Ambitious
    b.Reckless
35. a.Noisy
    b.Arrogant
36. a.Emotional
    b.Headstrong
37. a.Immature
    b.Quarrelsome
38. a.Unfriendly
    b.Self-seeking
39. a.Affected
    b.Moody
40. a.Stubborn
    b.Cold
41. a.Conceited
    b.Infantile
42. a.Shallow
    b.Stingy
43. a.Unstable
    b.Frivolous
44. a.Defensive
    b.Touchy
45. a.Tense
    b.Irritable
46. a.Dreamy
    b.Dependent
47. a.Changeable
    b.Prudish
48. a.Nervous
    b.Intolerant
49. a.Careless
    b.Foolish
50. a.Apathetic
    b.Egotistical
51. a.Despondent
    b.Evasive
52. a.Distractible
    b.Complaining
53. a.Weak
    b.Selfish
54. a.Rude
    b.Self-centered
55. a.Rattle-brained
    b.Disorderly
56. a.Fussy
    b.Submissive
57. a.Opinionated
    b.Pessimistic
58. a.Shiftless
    b.Bitter
59. a.Hard-hearted
    b.Self-pitying
60. a.Cynical
    b.Aggressive
61. a.Dissatisfied
    b.Outspoken
62. a.Undependable
    b.Resentful
63. a.Shy
    b.Excitable
64. a.Irresponsible
    b.Impatient

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Vocational/Personal Data

Please answer the following questions (items 1-6) by marking an X on the answer sheet in the box pertaining to your preferred response. Items 7-11 are fill-in-the-blank type questions, and the responses should be indicated on the appropriate place on the answer sheet.

1. I chose teaching as a profession: (a)When I was in graduate school (b)During my junior or senior year in undergraduate school (c)During my freshman or sophomore year in undergraduate school (d)When I was in high school (e)Prior to entering high school

2. On the average, I keep up with the articles in: (a)No scientific journals (b)One or two scientific journals (c)Three or four scientific journals (d)Five or six scientific journals (e)More than six scientific journals

3. I am a member of the following number of professional organizations: (a)None (b)One or two (c)Three or four (d)Five or six (e)More than six

4. I spend the following approximate number of hours weekly in connection with my work (including time spent both at my place of employment and elsewhere): (a)30 or less (b)31 to 40 (c)40 to 50 (d)50 to 65 (e)65 or over

5. In relation to my work, I: (a)Am completely happy only when working (b)Get a great deal of satisfaction from it (c)Get some satisfaction from it (d)Am not too happy with my vocational choice (e)Wish I had gone into another field

6. Concerning professional positions, the most important one of the following factors, in my opinion, is: (a)Opportunity for permanent work and for advancement (b)Stimulating associates and atmosphere conducive to teaching (c)Opportunity to combine teaching with research or administrative duties (d)Opportunity to do really creative research and to choose problems of interest to me

7. My age to nearest birthday is:________________________years.

8. My highest earned degree is at the level of (doctorate, master's or bachelor's):________________________.

9. My area of specialization is (indicate experimental psychology, clinical psychology, biochemistry, etc.):________________________________.

10. The faculty rank I currently hold is:______________________________.

11. I have the following number of scientific products to my credit:
    a.______________number of published scientific articles (include joint publications)
    b.______________number of published scientific books (include edited books and joint publications)
    c.______________number of patents (include only patents that have been issued in your name or jointly with others)

After completing all of the above items please turn to the Barron-Welsh Art Scale and complete those items. THEN RETURN THE TWO ANSWER SHEETS ONLY.

APPENDIX C

Barron-Welsh Art Scale

Barron-Welsh Art Scale

DEVISED BY
GEORGE S. WELSH, PH.D.
AND
FRANK BARRON, PH.D.

A Portion of the

Welsh Figure Preference Test

DIRECTIONS

(1) You are asked to decide whether you like or don't like each of the drawings on the following pages.

(2) Record your answers on the separate answer sheet by making a heavy mark opposite "L" (for Like) or "D" (for Don't Like). On some answer sheets the labels may be "T" (or True) for Like, and "F" (or False) for Don't Like. Be sure the number of the drawing you are considering is the same as the number you mark on the answer sheet.

If you can't decide, guess. Do not skip any drawings. Try to work as fast as you can.

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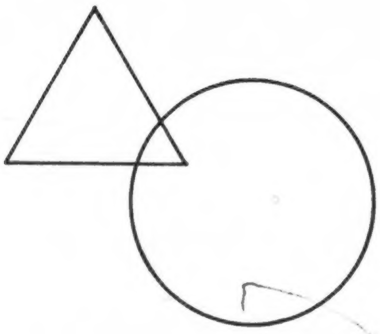

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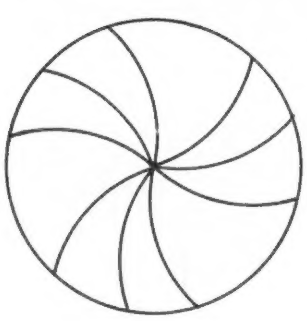

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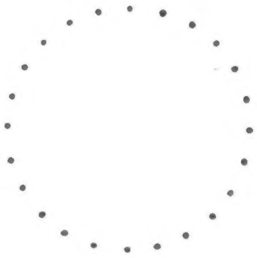

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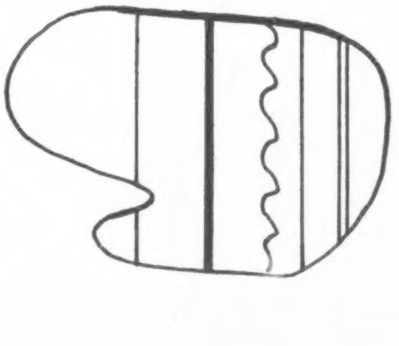

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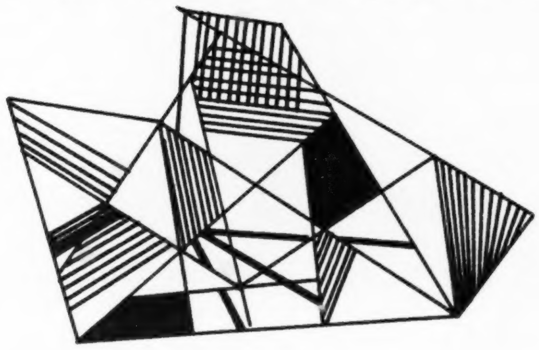

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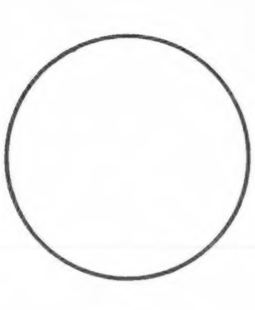

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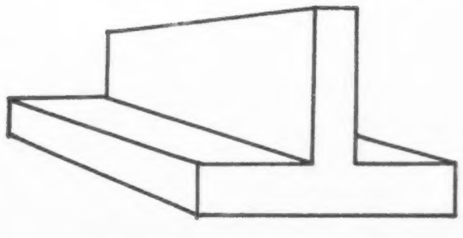

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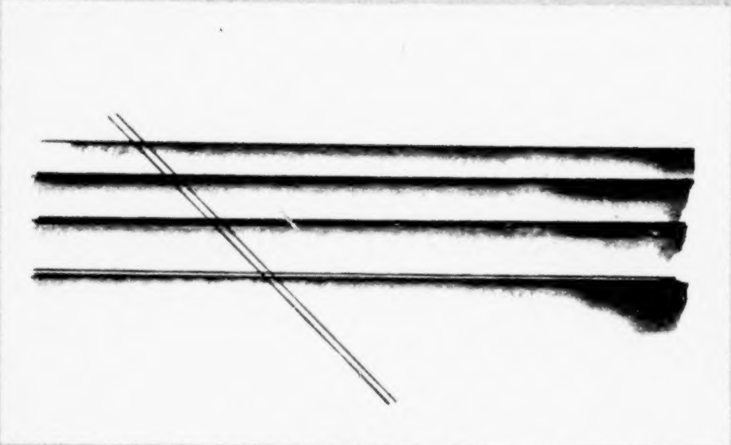

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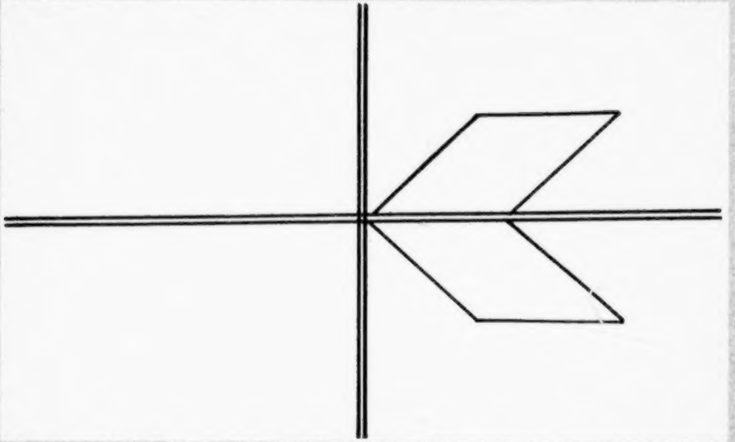

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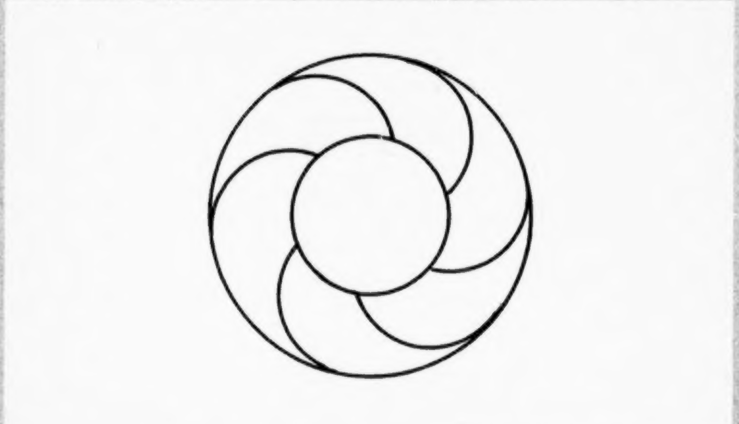

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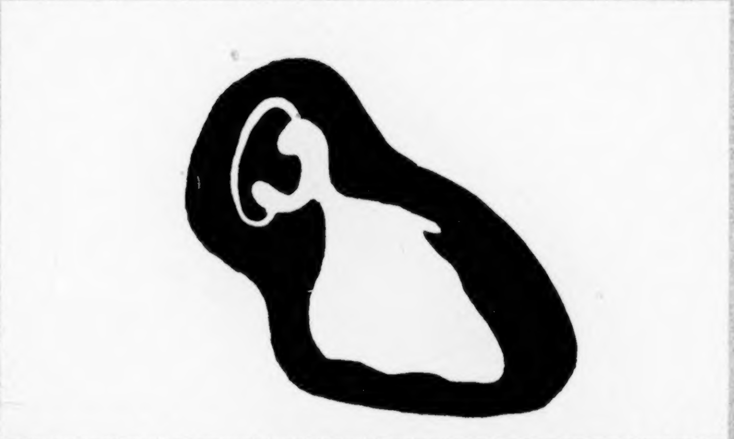

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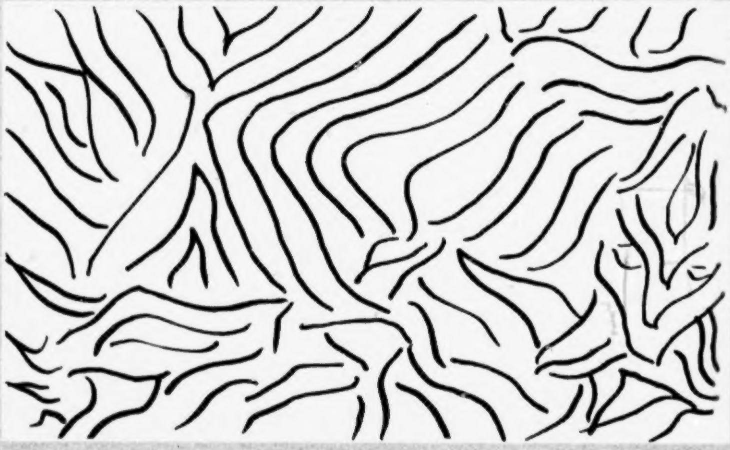

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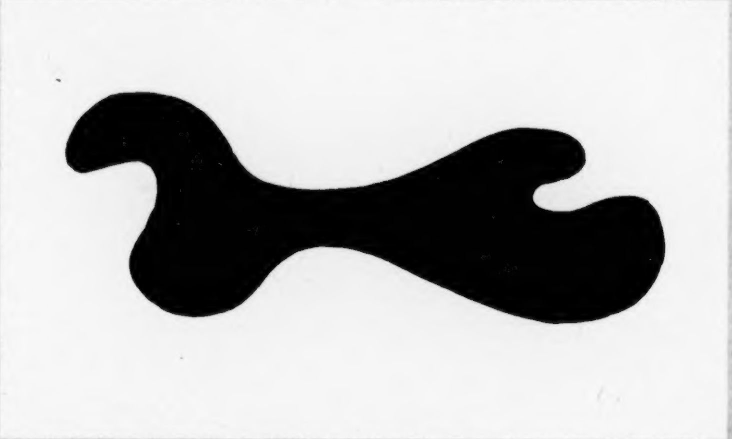

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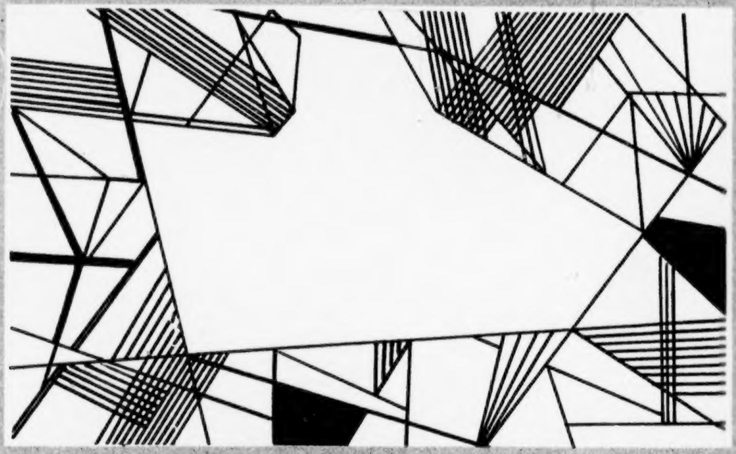

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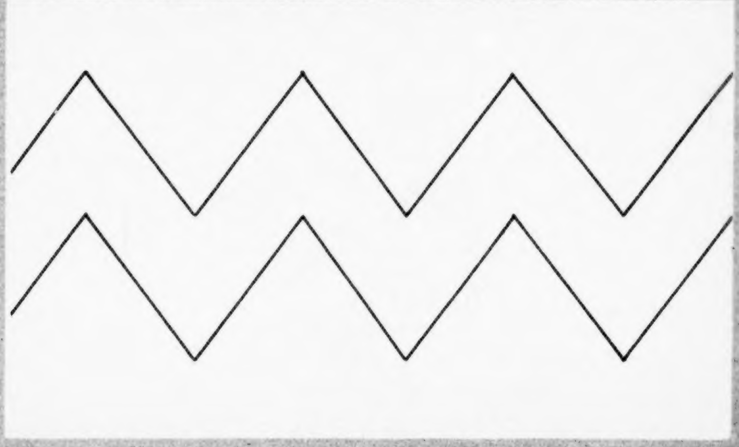

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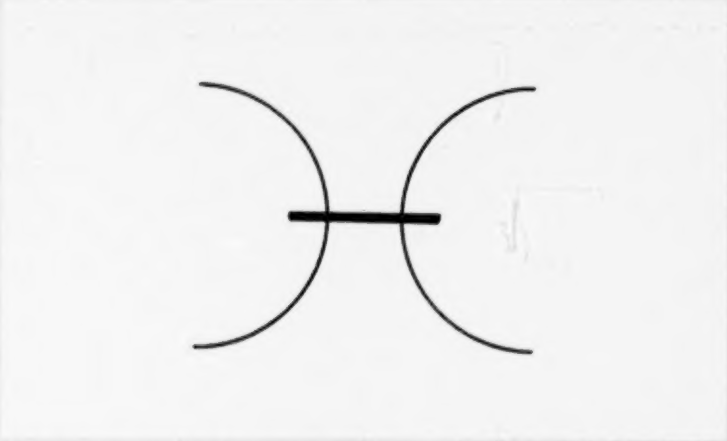

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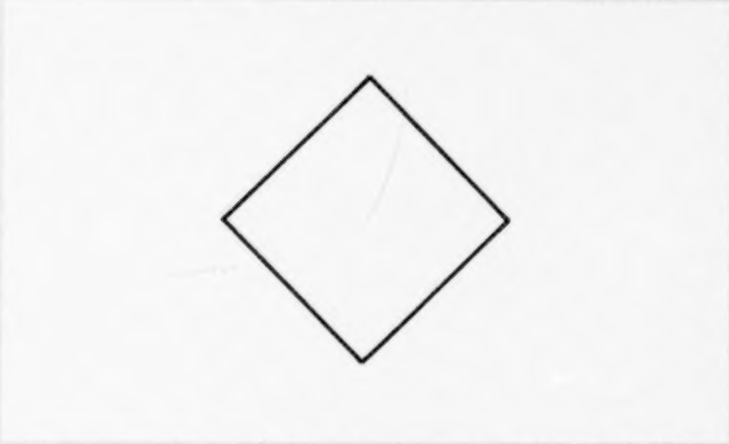

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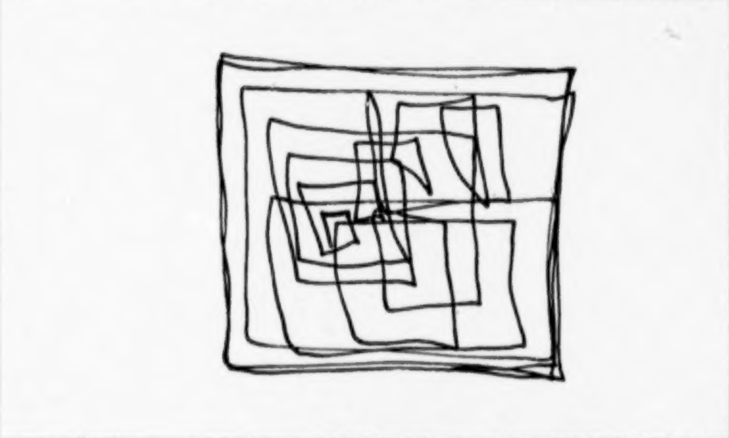

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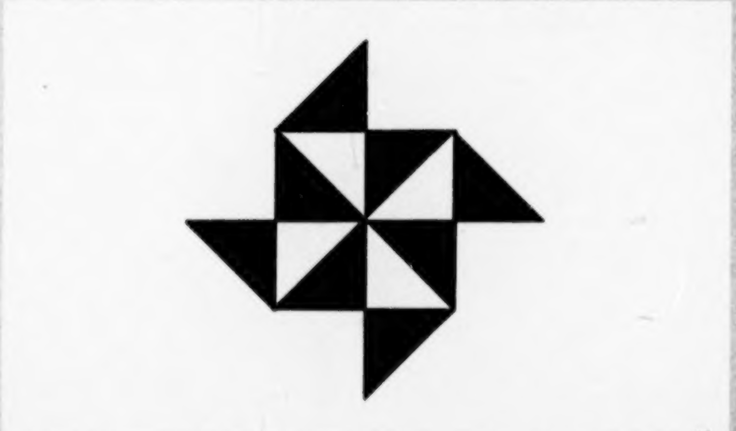

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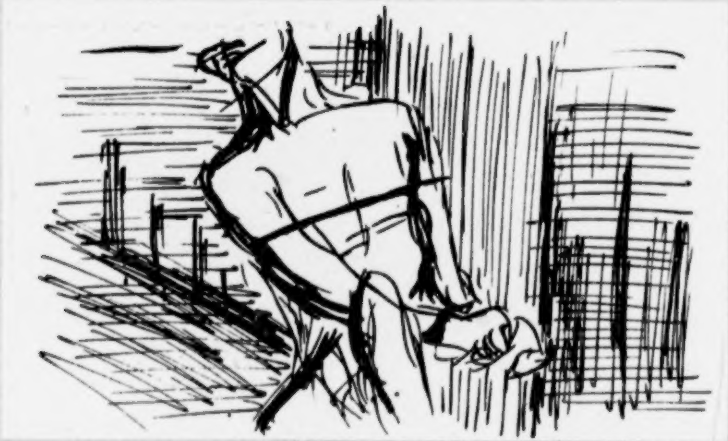

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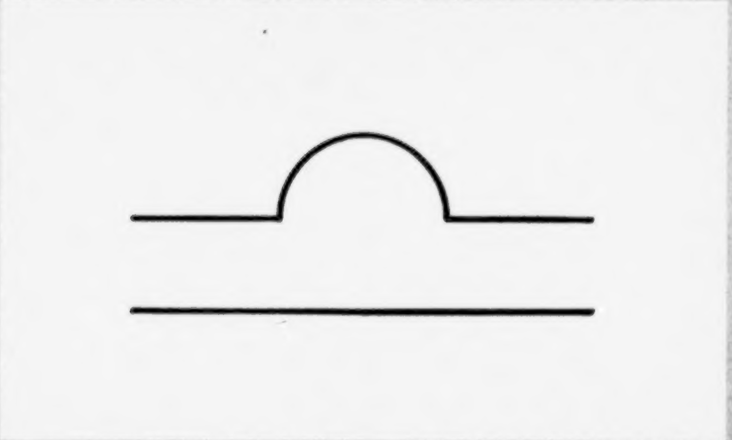

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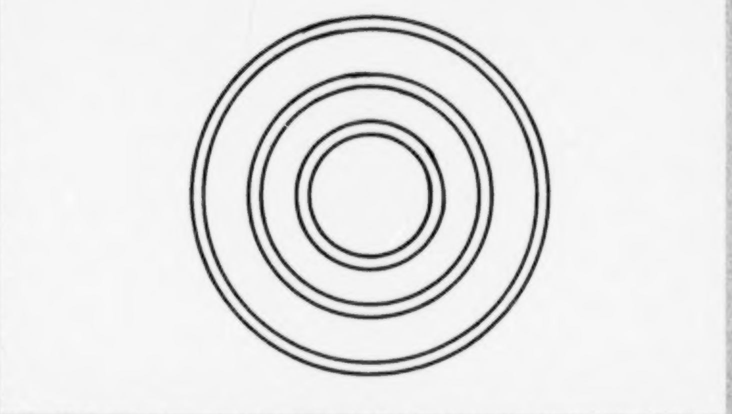

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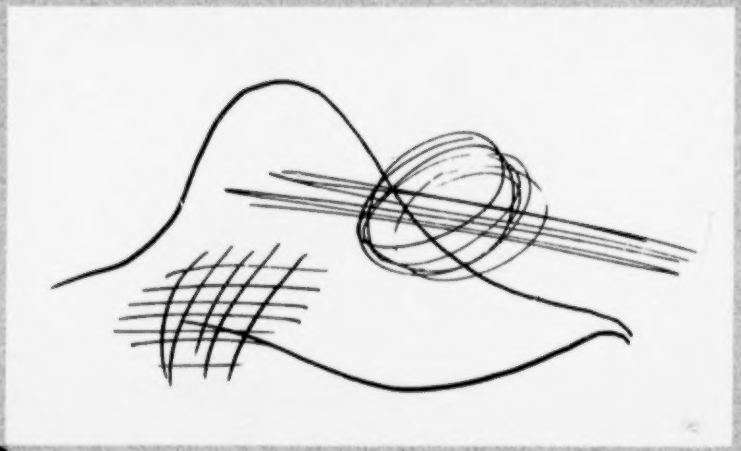

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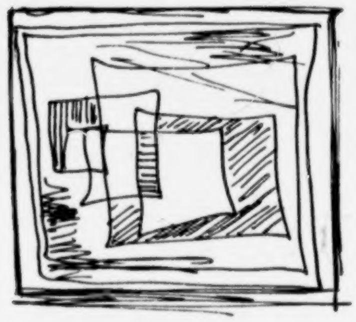

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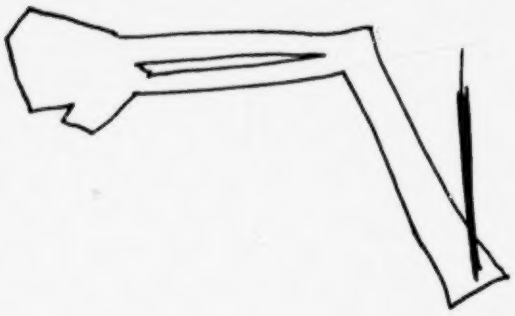

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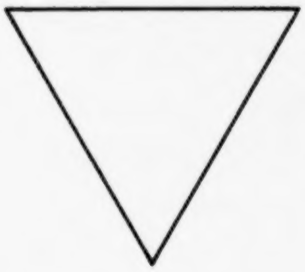

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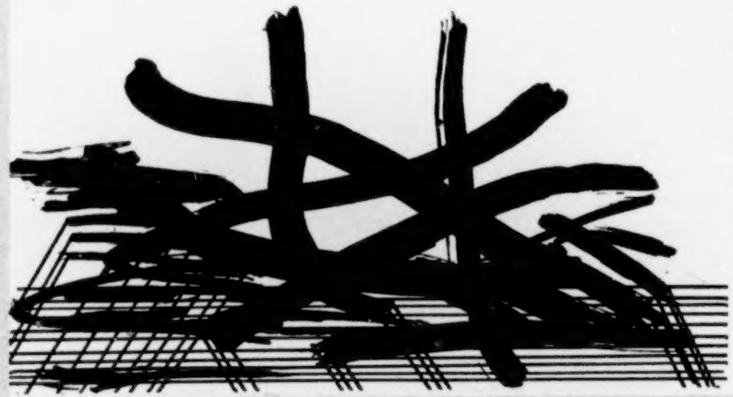

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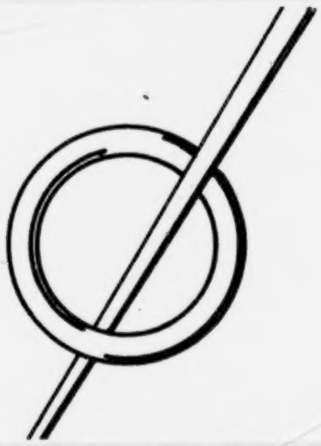

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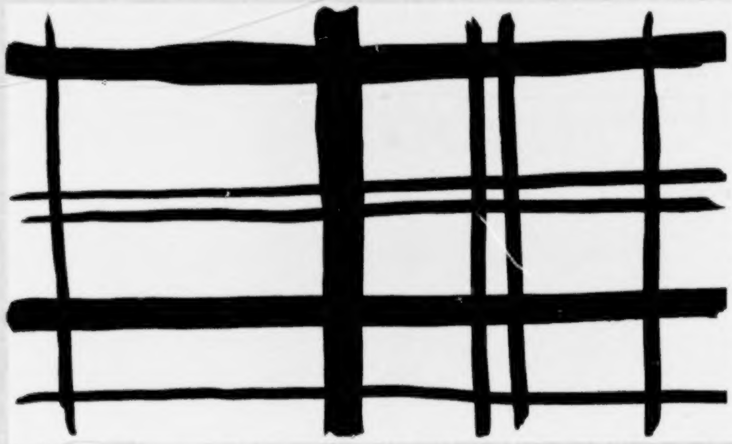

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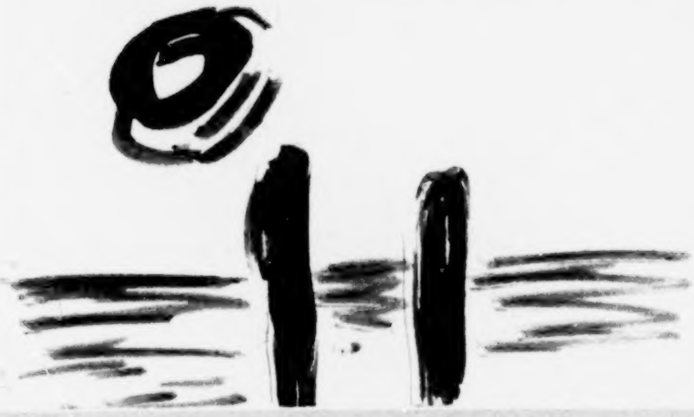

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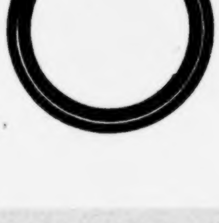

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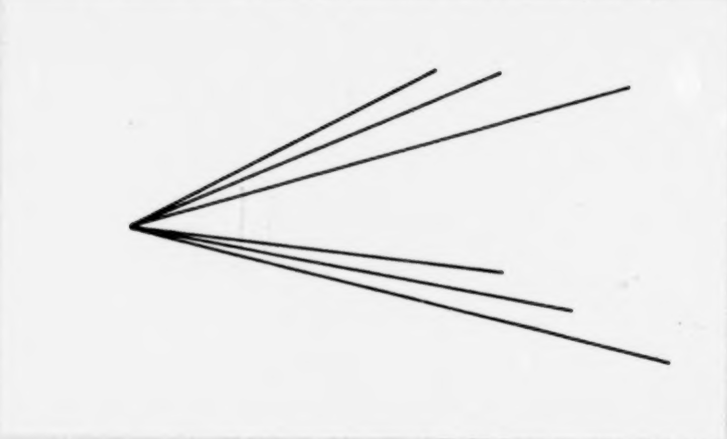
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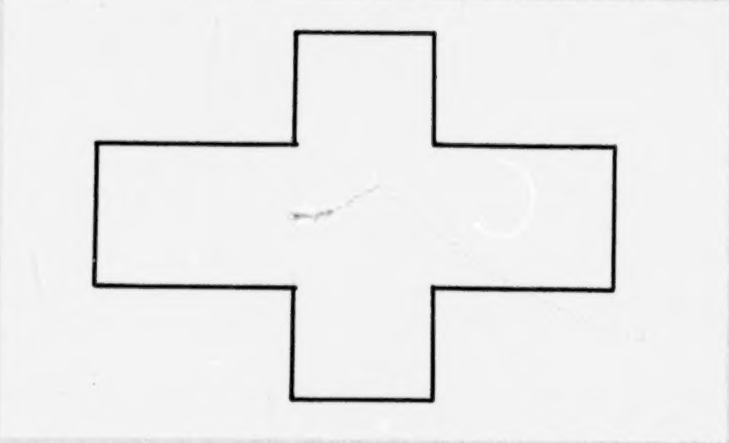
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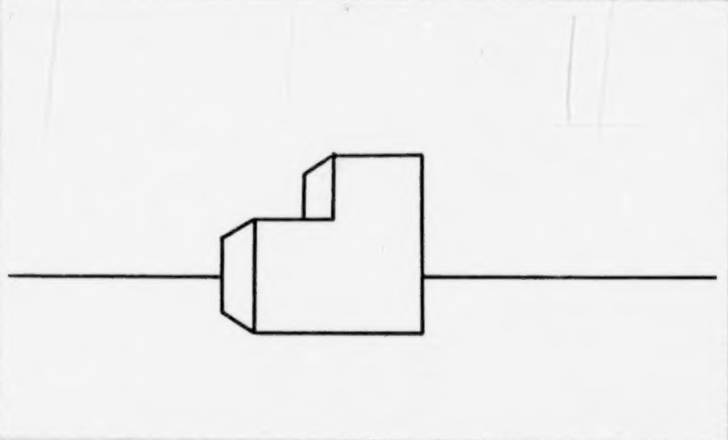
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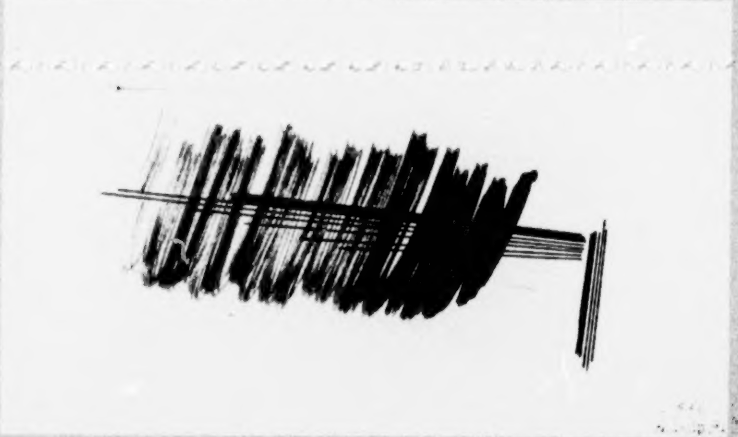
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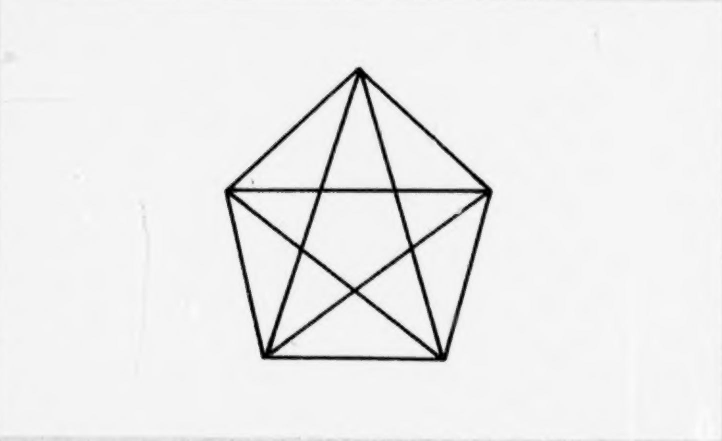
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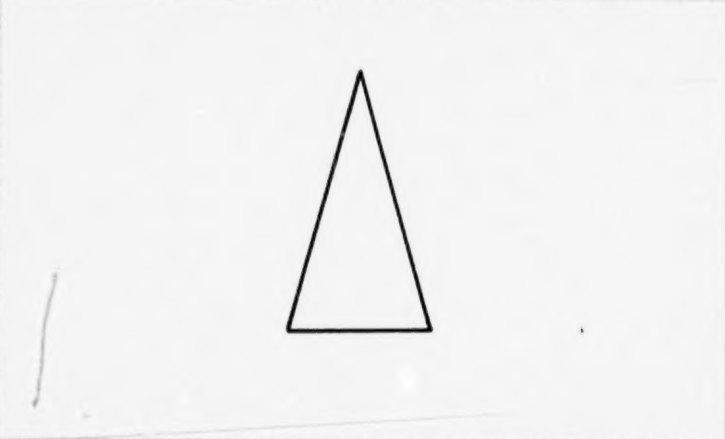
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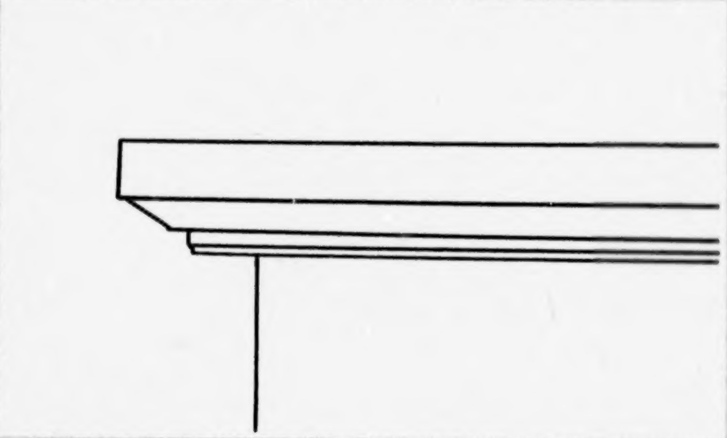
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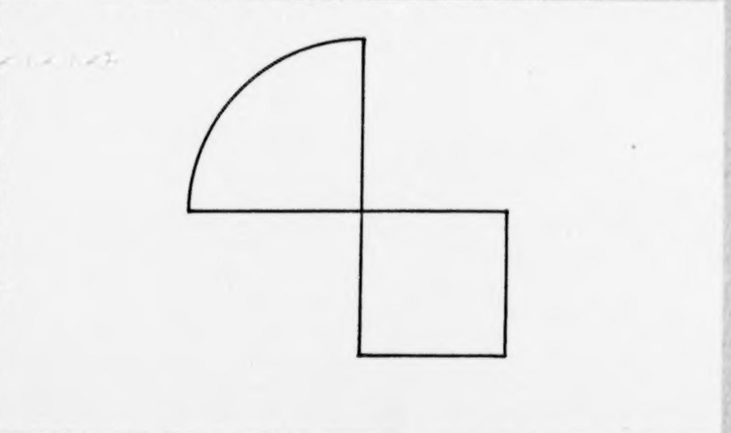
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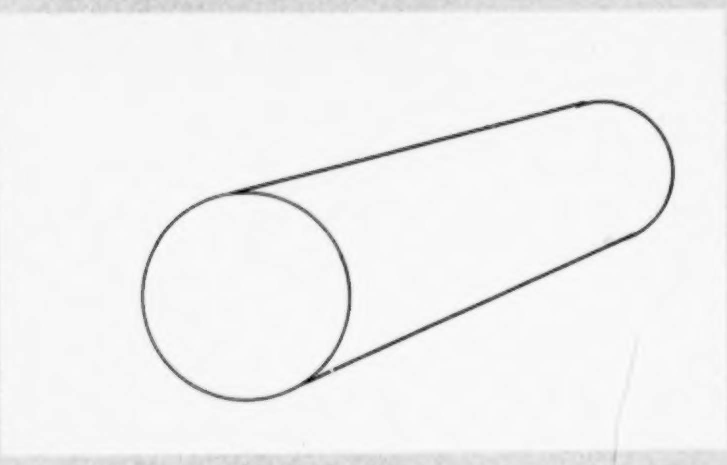

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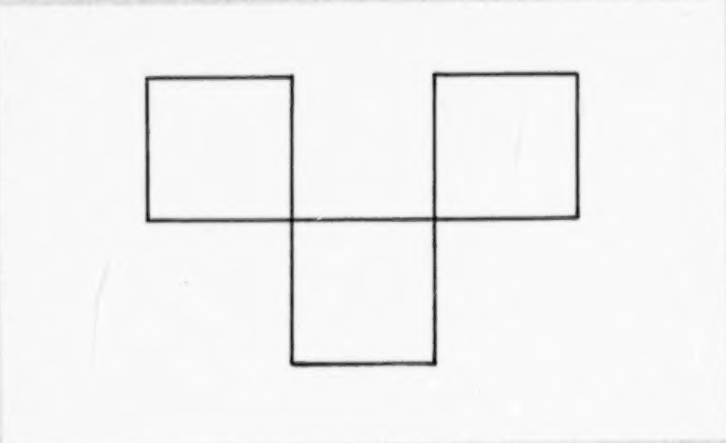

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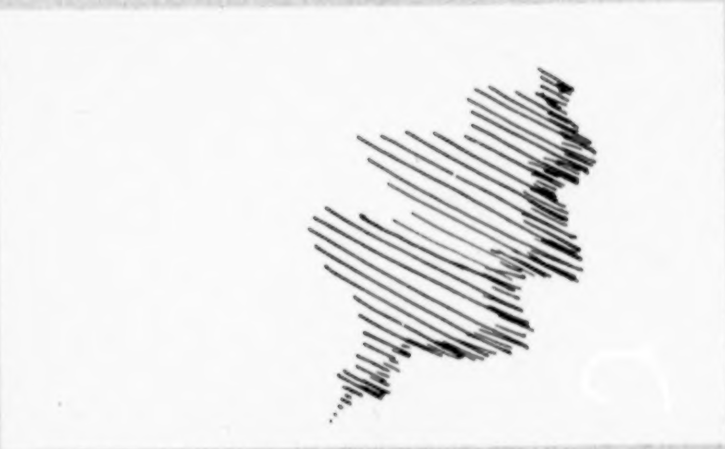

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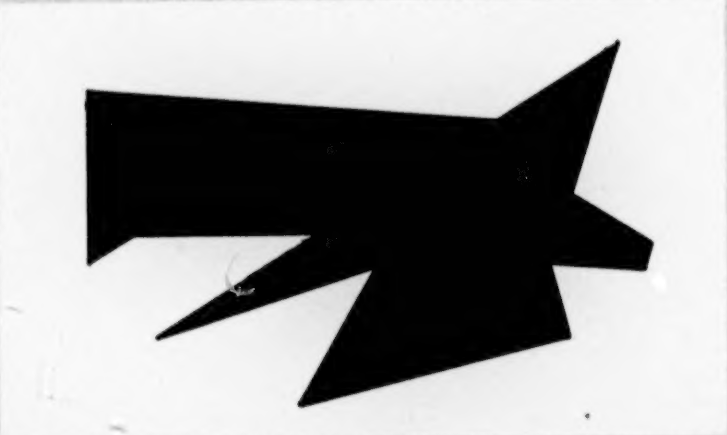

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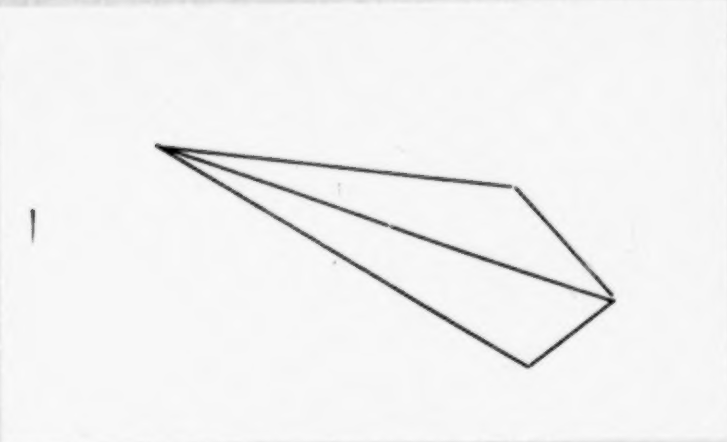

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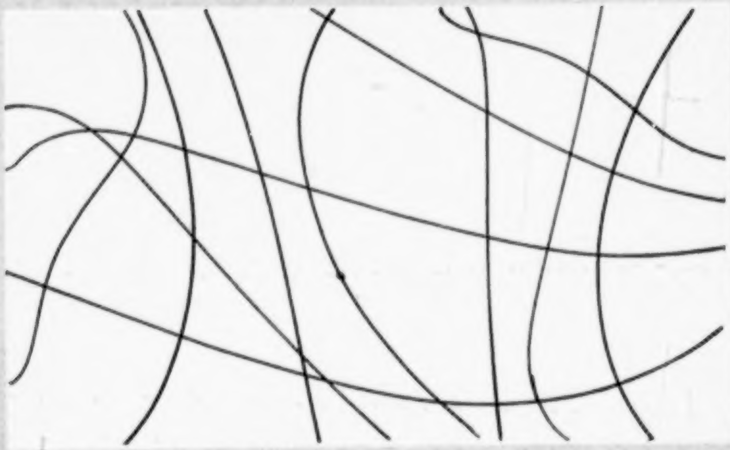

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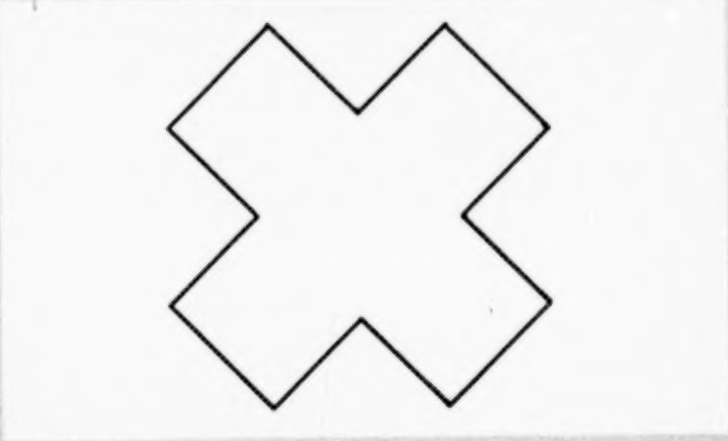

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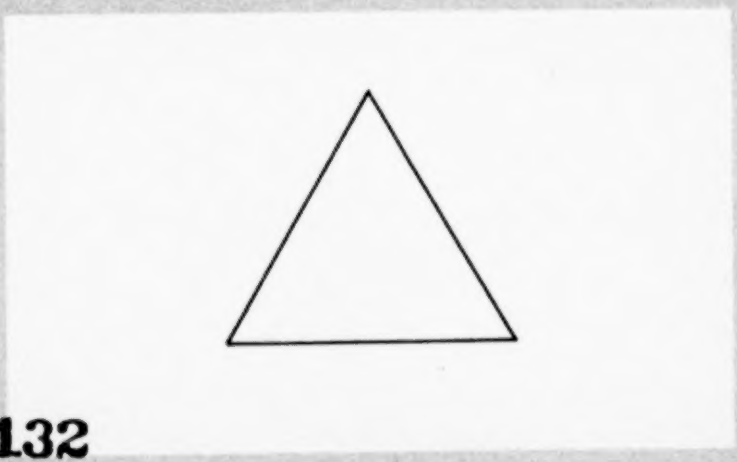

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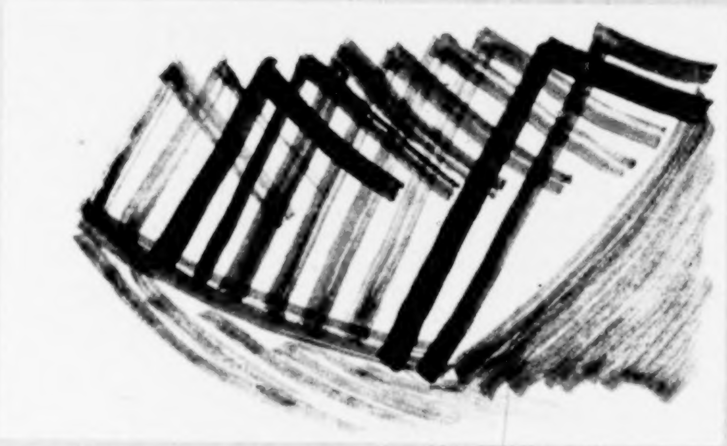
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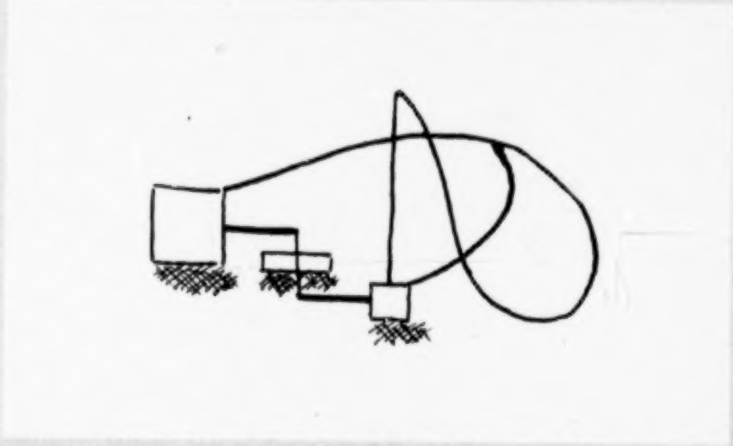
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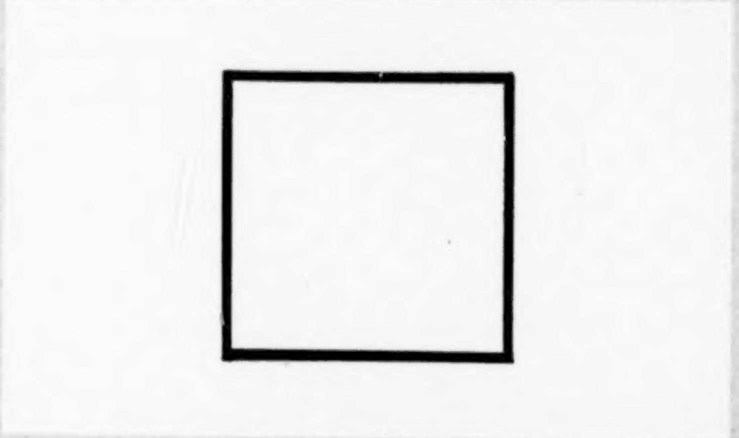
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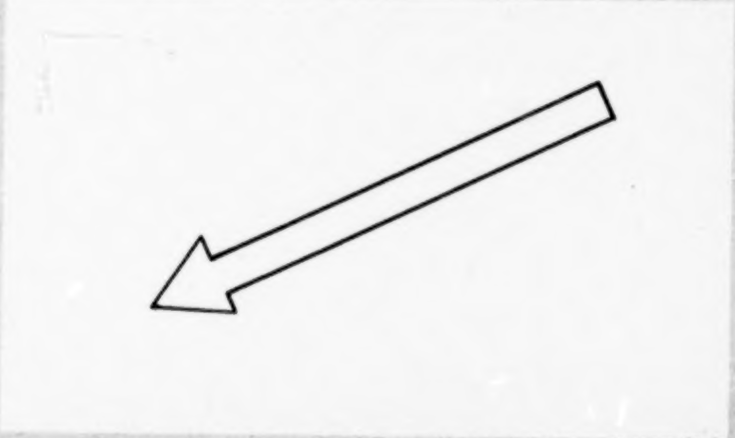
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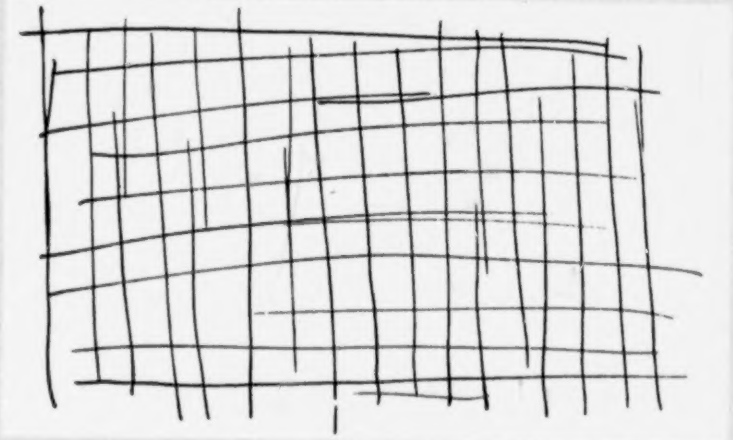
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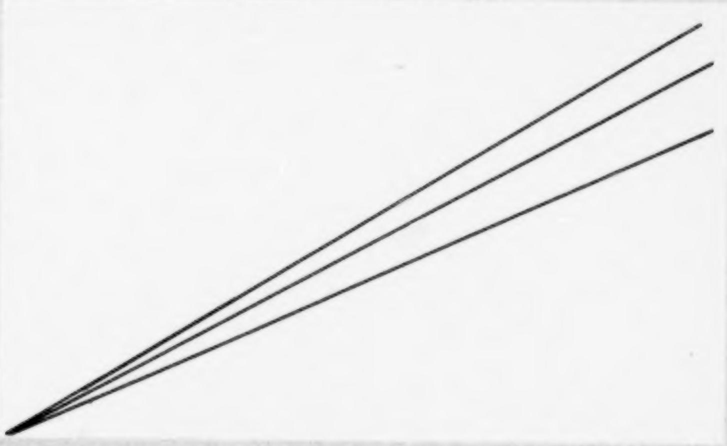
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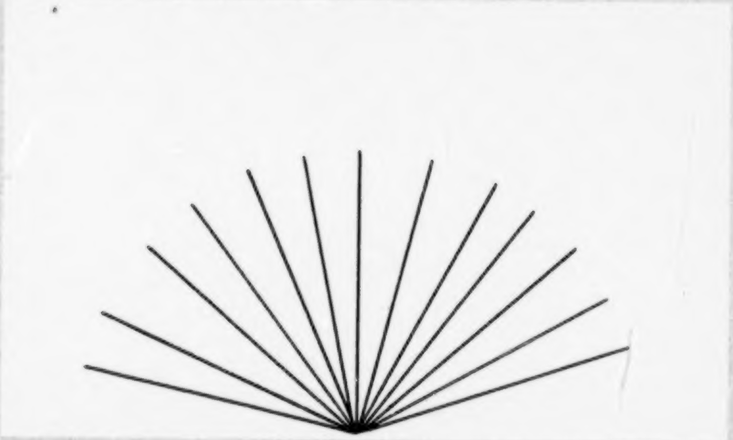
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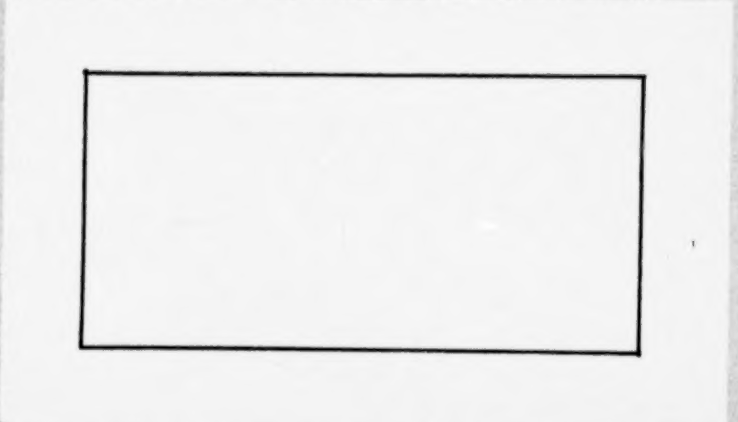
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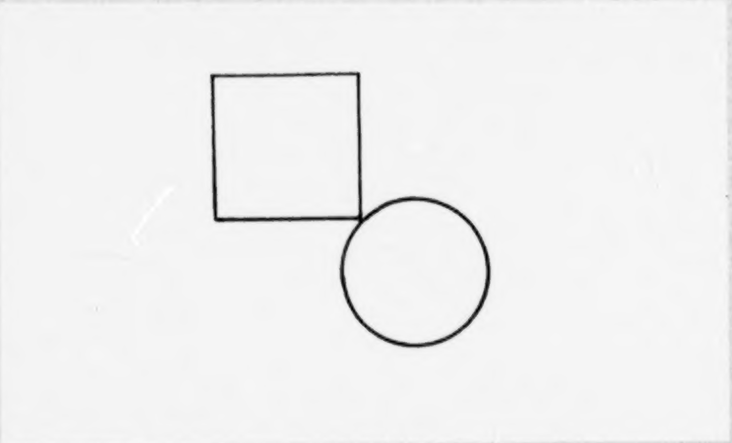

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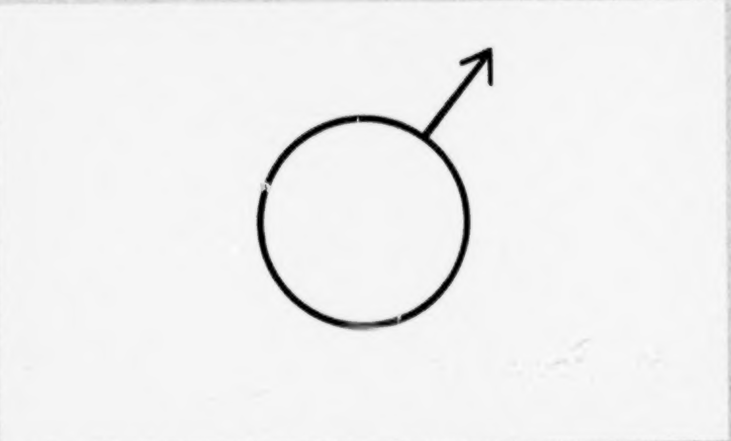

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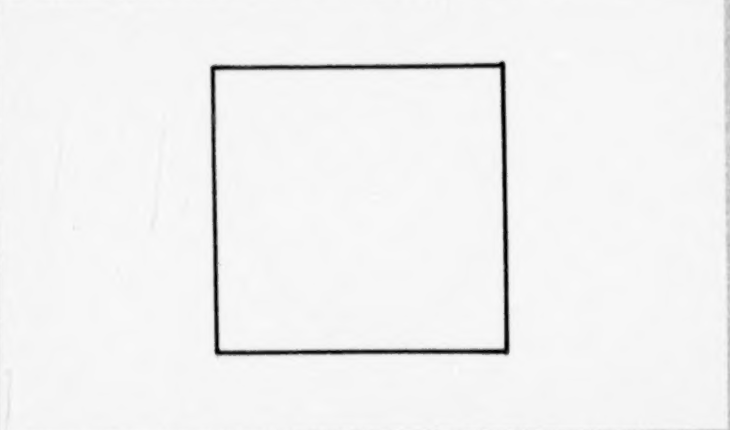

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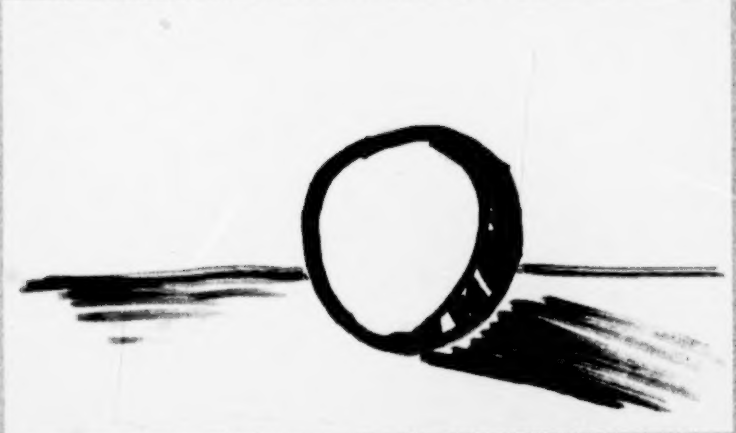

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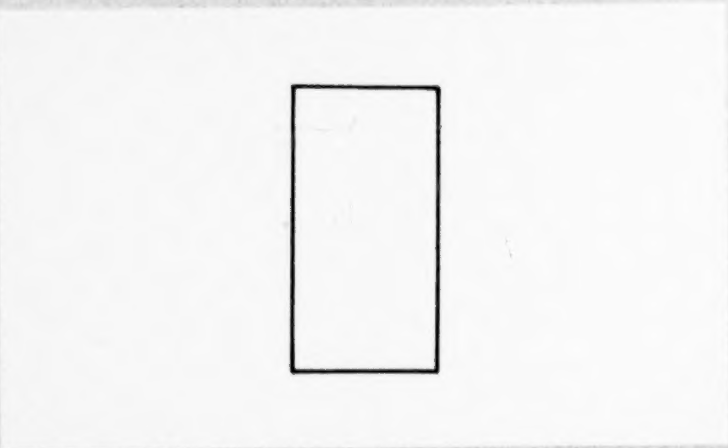

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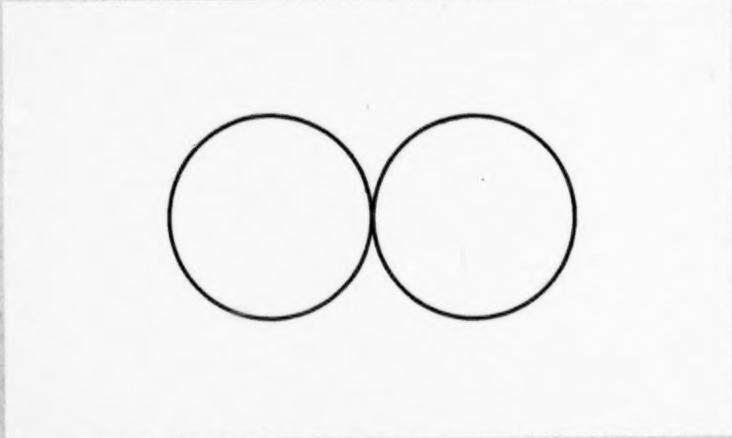

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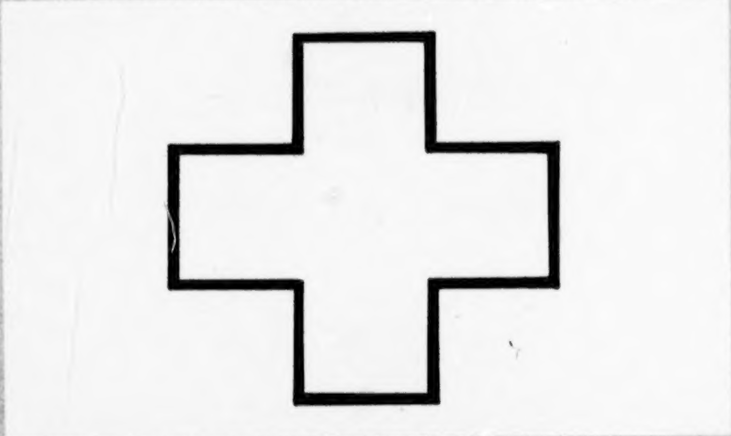

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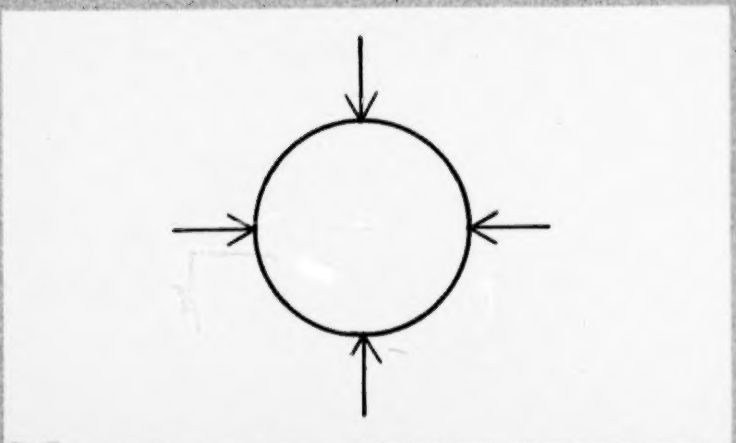

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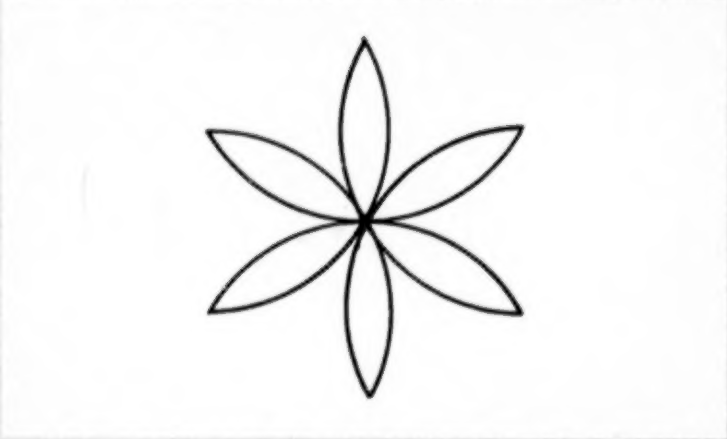

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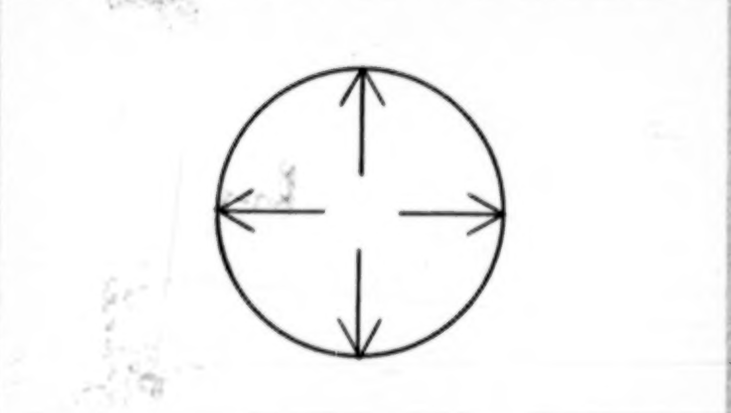

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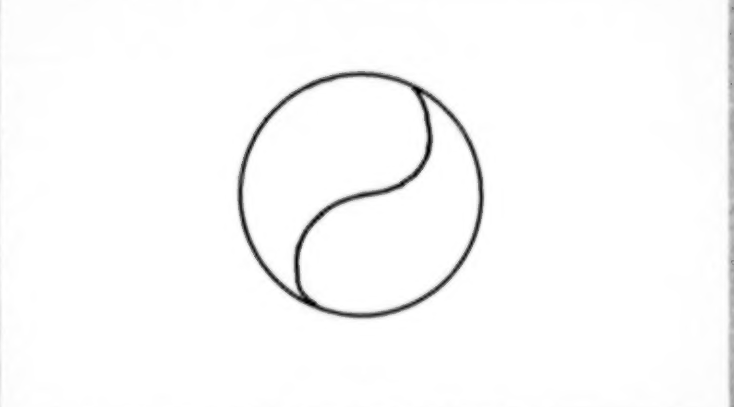

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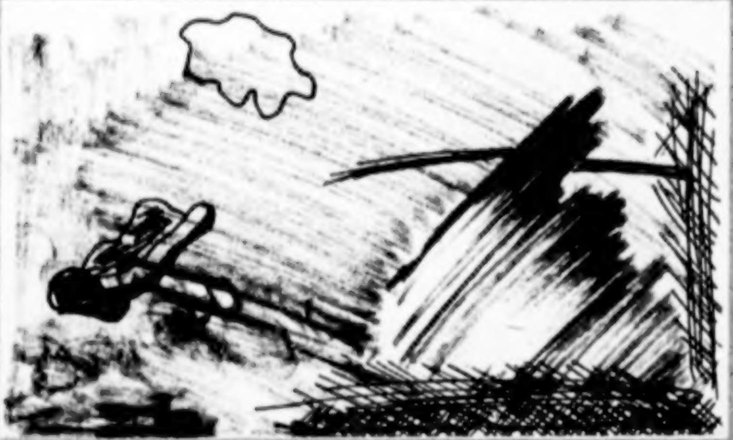

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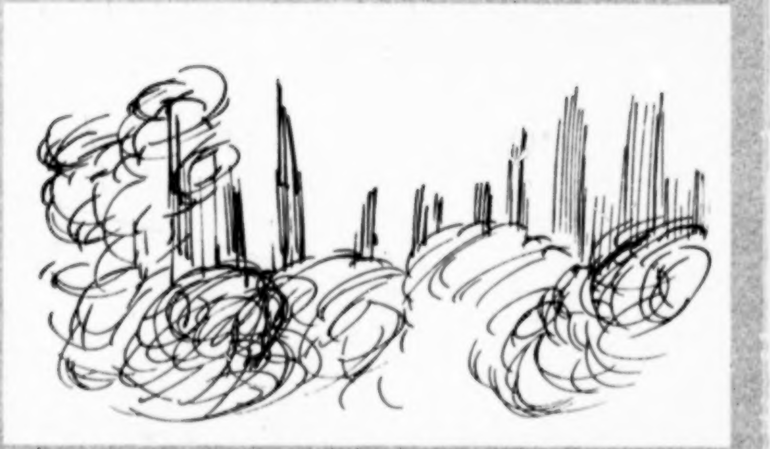

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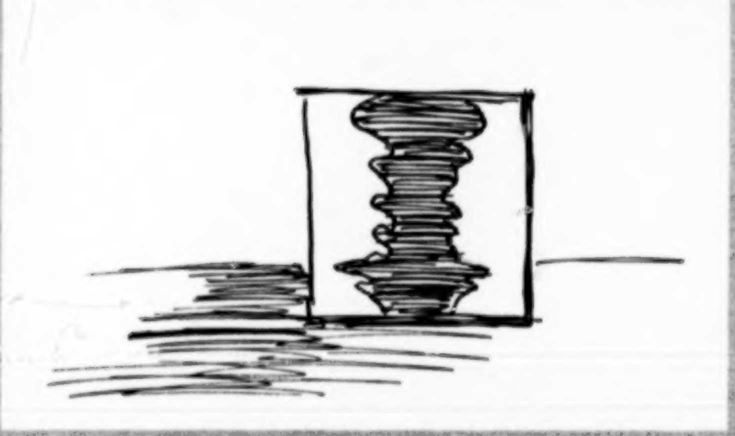

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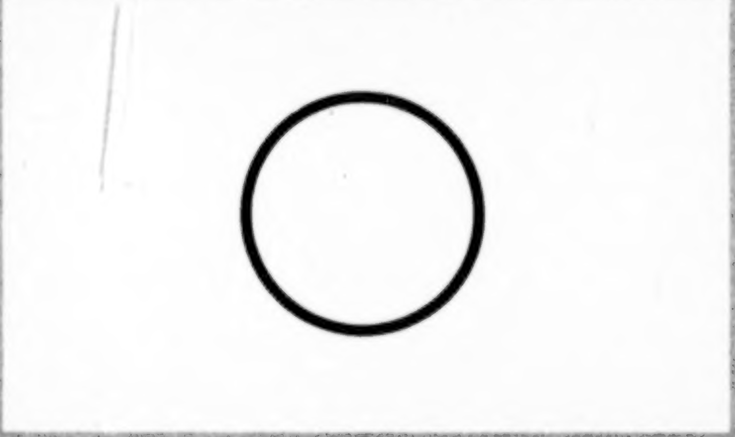

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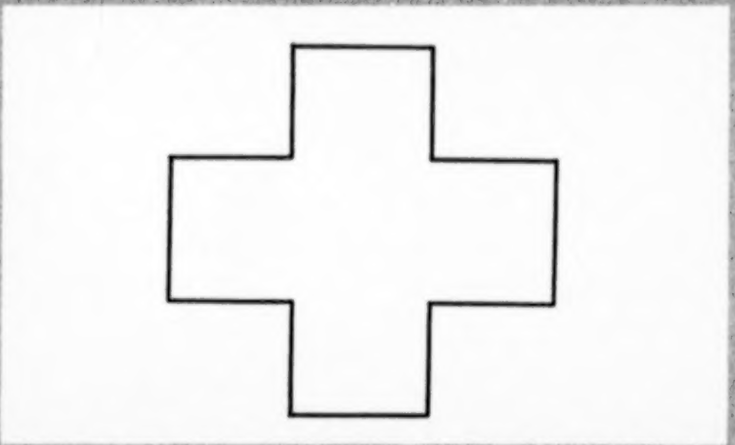

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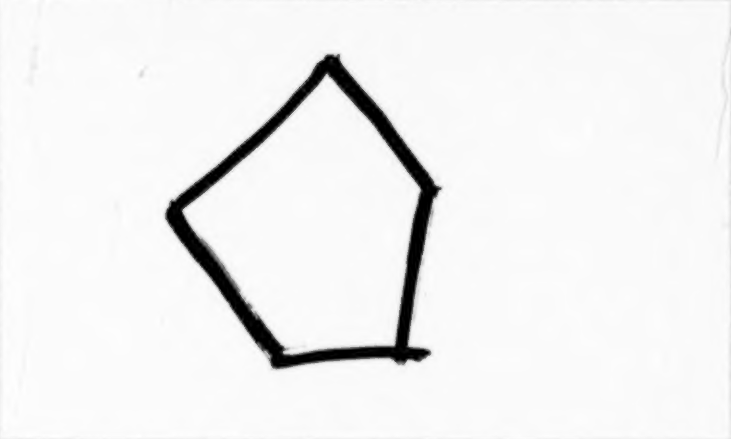

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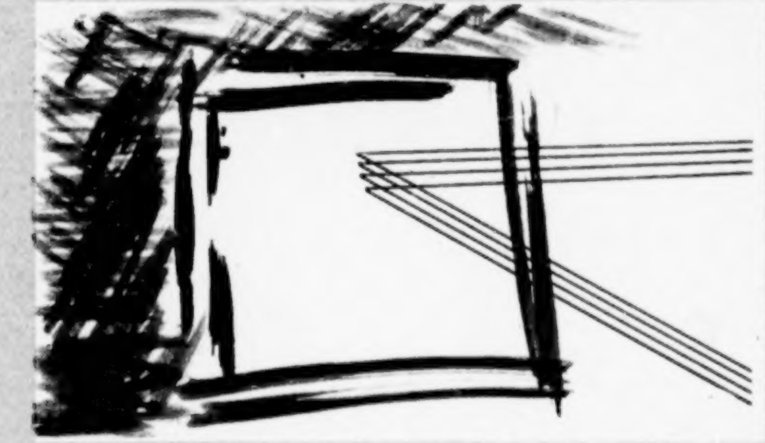

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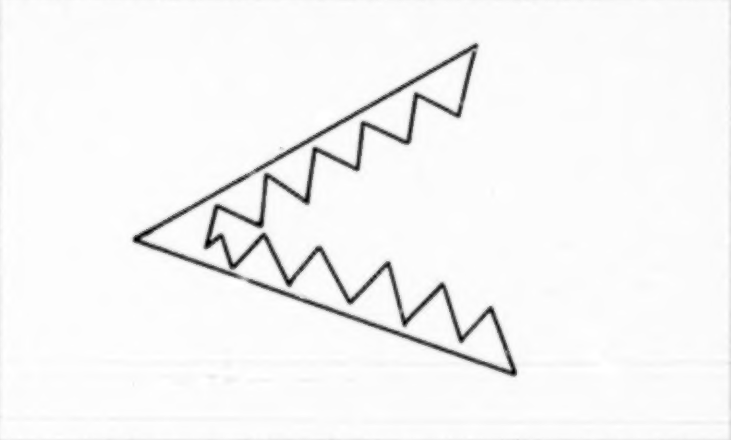

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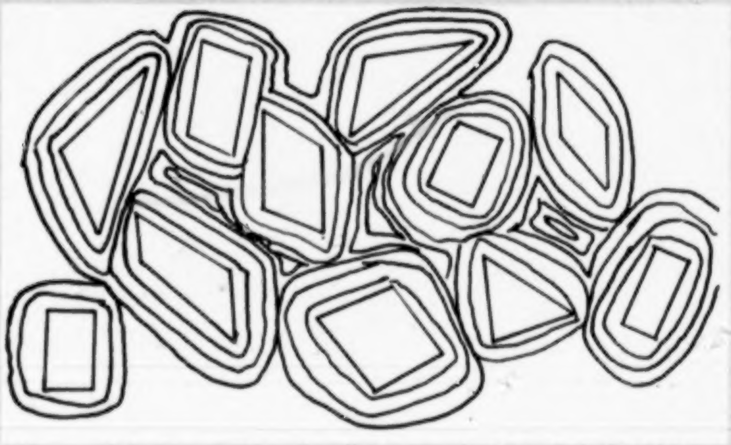

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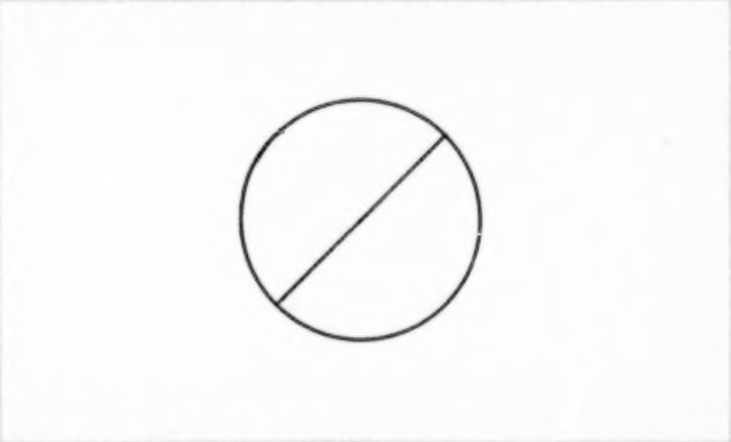

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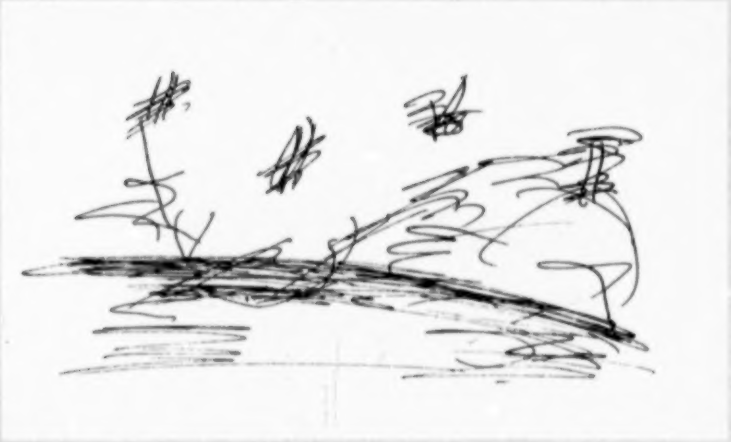

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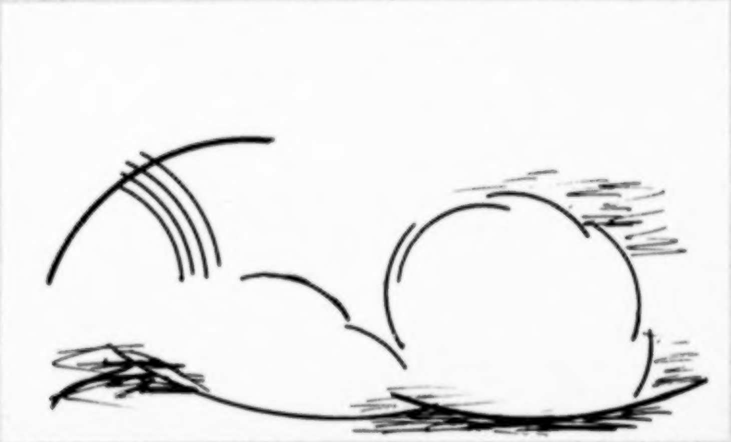

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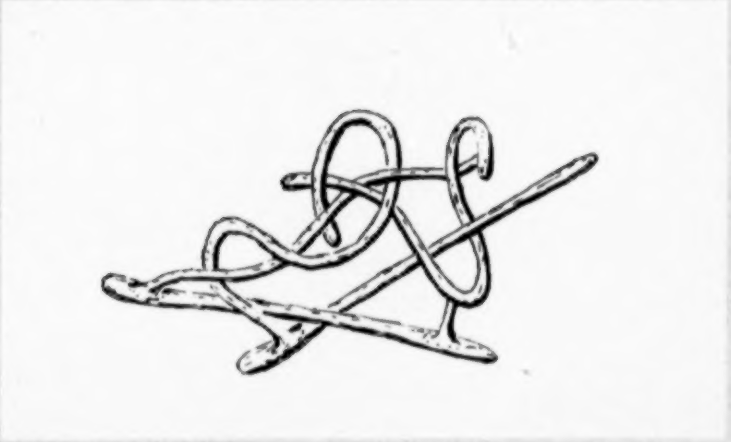

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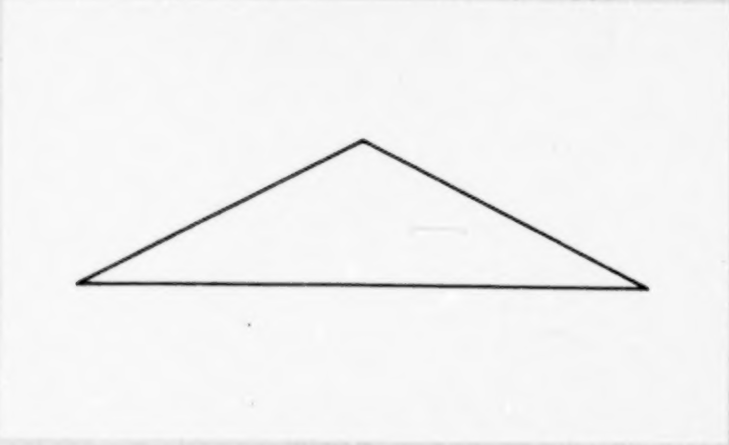

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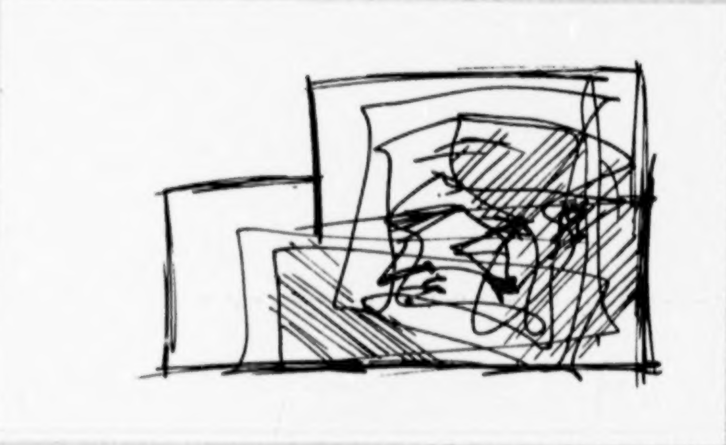

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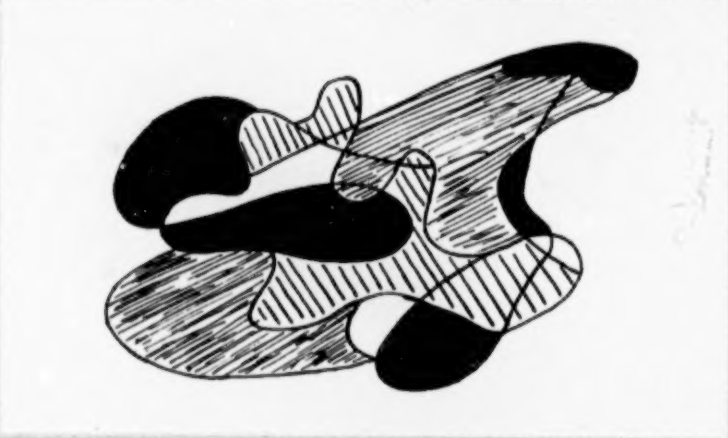

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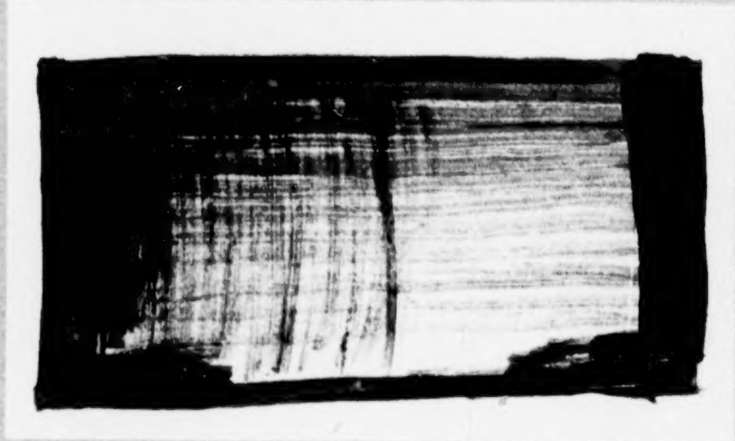

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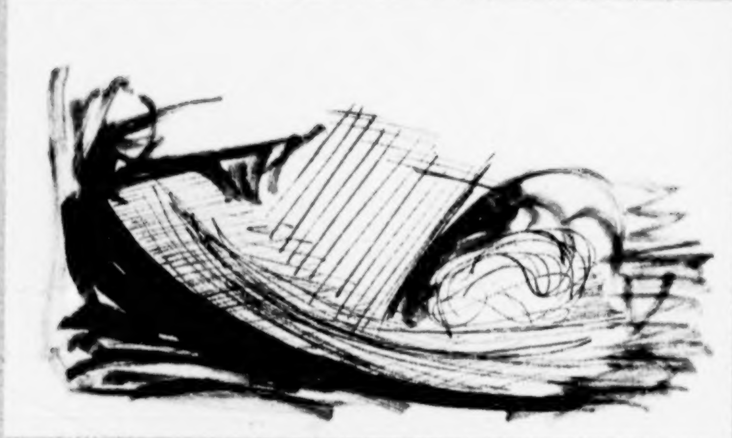

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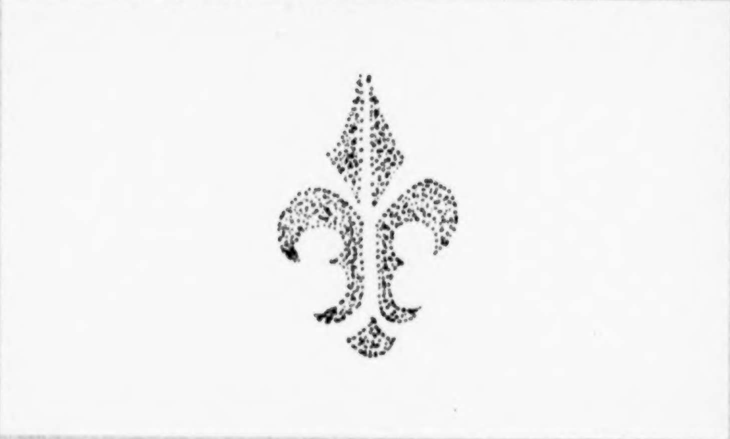

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